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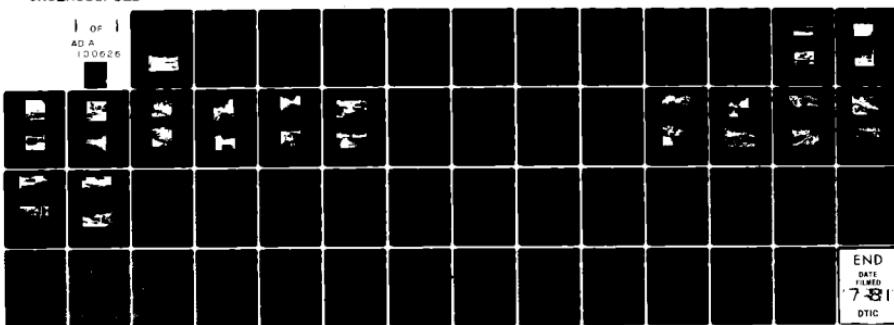
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FLOOD PLAIN INFORMATION. FLOOD HAZARD REPORT OF 4-7 JULY 1969 F--ETC(U)
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FLOOD PLAIN INFORMATION

FLOOD HAZARD REPORT

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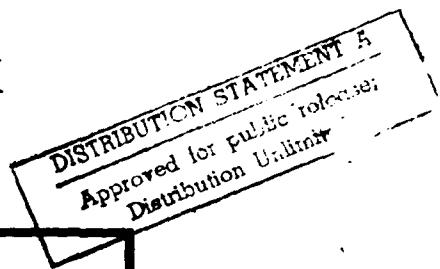
OF

4-7 JULY 1969 FLOOD

HURON RIVER

NORWALK CREEK

OHIO



JUN 25 1981



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PREPARED BY

U. S. ARMY ENGINEER DISTRICT, BUFFALO

MAY 1970

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Floods Flooding Huron River		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) THIS FLOOD HAZARD REPORT HAS BEEN PREPARED FOR THE USE OF State and local government agencies, planners, developers, individuals and others that may have a need for this type of information. The flooded area map and the water surface profile of the July 1969 Flood are shown in this report and are based on the information gathered during and immediately after the flood.		

INTRODUCTION

This flood hazard report has been prepared for the use of State and local government agencies, planners, developers, individuals and others that may have a need for this type of information. This report will be most beneficial to those who are involved in authorizing, planning or constructing any type of development in the flood plain.

The flooded area map and the water surface profile of the July 1969 Flood are shown in this report and are based on the information gathered during and immediately after the flood. The flooded area map shows those areas where flood hazards must be considered. The profiles indicate the amount of fill required or to what elevation flood proofing must be provided to prevent damage. You can locate your home or building site on the map. Use the river mile of your site, as shown on the map, and find the flood elevation on the profile for the same river mile.

Future development within the flood area should not be allowed indiscriminately. The Flood Plain Management program does not recommend that future development be eliminated from the flood plain, only controlled. Of primary importance, a floodway width should be established within which no restrictive construction or fills are allowed. This insures that there is room to pass future floods. Less frequently flooded areas can be used for those developments which are not affected by flooding or which have been constructed so

as to prevent damage or have been placed above flood levels. An illustrative example of recommended flood plain uses is shown in exhibit 1.

It is the responsibility of all levels of government in the State to protect unsuspecting buyers from the anguish of having their personal property damaged or destroyed by floods. Planners at all levels must not ignore the possibility of future floods of equal or greater extent than those which have already occurred. Developments must be planned to stay out of flood areas, be compatible with flooding, be constructed above flood levels, or be provided with adequate flood protection. For those already in the flood plain there are pamphlets available which describe methods which can be used to provide flood proofing of structures. Quantities of these pamphlets have been distributed to the municipal offices covered by this report.

The description of floods and the photographs in this report show that damages will continue to increase if unwise development increases. The photographs especially show the results of unwise development.

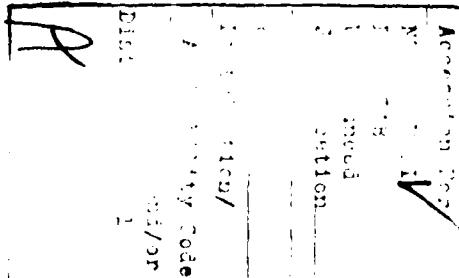
As damages that occurred from the July 1969 Flood were readily available they have been included in this report to remind all concerned of the damages that can occur if flood hazards are not given proper consideration when planning developments. Over a long period of time a flood of the magnitude of the July 1969 Flood should not occur frequently, perhaps once in 100 years, but there is no way to

know when another flood of similar size will occur. Valuable developments should be constructed above the July 1969 Flood levels or protected from a recurrence of that magnitude of flooding in order to be relatively safe from future damages.

The areas affected by the July 1969 Flood will probably be studied to determine whether flood control projects are justified. Flood control projects are usually justified only in populated areas where damages are high so that the remaining areas must have controlling regulations to help prevent damages to future development. Even areas where improvement projects are constructed cannot be protected from all possible floods so that controlling regulations are still needed to guide new construction.

Some flood plain management can be carried out on a voluntary basis if everyone concerned will use the information in this report to guide their planning and construction. The program is much more effective and uniform and will be tailored to the needs of the community if it is based on regulations drawn up and adopted by the local governments. The staff of the Buffalo District is available to provide technical assistance in developing ordinances and regulations.

In the State of Ohio, the power to adopt and enforce zoning regulations is delegated to political subdivisions. The enabling statutes are sections 303.02, 519.02 and 713.07 of the revised code and they provide for regulation of land use by counties, cities, and



towns. If flood plain development is allowed to continue without any controls the next major flood will cause even more damage and destruction. Individual property owners must make it known to their local governments that they desire and will support well planned land use regulations.

The Buffalo District, Corps of Engineers, is available for assistance to anyone interested in reducing possible future flood damages. The Corps of Engineers does not have, nor want, the authority to regulate development in flood plain lands, but, through our Flood Plain Management Services Program we have provided the flood outlines and elevations on which local communities can base regulations. This office will furnish, upon request, examples of flood plain regulations adopted in communities throughout the United States.

A general information map on the 4-7 July 1969 storm is shown on plate I.

HURON RIVER, OHIO

Lake Erie to Johnson Road in Township of Peru
on East Branch of Huron River

Lake Erie to Standardsburg on West Branch of Huron River

A water stage recorder operated by the U. S. Geological Survey on the Huron River is located on the right bank about 500 feet downstream of U. S. Highway 250, 0.25 mile northwest of Milan, Erie County, and two miles downstream of the confluence of the east and west branches. The gaging station was established in March 1950 and records [redacted] stages resulting from the runoff from 371 square miles of watershed upstream of that point. The total drainage area at the mouth is 406 square miles. Shown on plate 2 are the stage and discharge hydrographs for the July 1969 storm. The data for the peak of the stage-hydrograph was established by indirect survey methods furnished by the U. S. G. S. because the gage chart was apparently damaged during the flood.

The stage at the gage site in July 1969 (31.1 feet) was 7 feet higher than the stage for the January 1959 highwater occurrence (24.1 feet). The discharge in 1959 was 25,800 cfs and it has a recurrence interval in the order of once in 40 years. The 1969 flood has an estimated discharge of 48,900 cfs and it has a recurrence interval in the order of once in 125 years. The stage-discharge, discharge-frequency and stage-frequency curves are shown on plates 3, 4, and 5 respectively.

Based on precipitation gages in the Huron River watershed it is estimated that about 7.3 inches of rain fell within a 24-hour period with an average intensity of 0.30 inches per hour. From the rainfall intensity-duration-frequency curve shown on plate 6 for the Huron River Basin, the average intensity of 0.30 inches per hour for 24 hours has an occurrence less frequent than once in 100 years.

The area inundated by the July 1969 flood is shown on plates 7 and 8. A water surface profile, constructed from highwater marks obtained by Buffalo District personnel shortly after the July flood is shown on plates 9 through 11.

A brief description of the July 1969 flood is given in the following paragraphs. Comparative data for this flood and several other highwater occurrences are given in table I following the flood description.

July 1969 - In the city of Huron the river forced hundreds of persons from their homes while flooding several areas in the city. Army amphibious vehicles (duks) were called upon to evacuate persons stranded by high water. The Bogart Road area in Huron was turned into a large lake. Huron volunteer firemen rescued about 50 families from Huron Heights, a lagoon community along the river just south of the city. Earlier efforts to reach them with Army "duks" failed because it was too difficult for them to maneuver in the rain swollen river. The firemen were able to reach the homes only after the flood

water had receded. Many of the marinas suffered extensive damage. All roads from Huron to Norwalk were closed to traffic.

The areas which were hardest hit were the resort areas on Franklin Flats, Boyer's Trailer Park and Willow Bend Campsite. It is estimated that about 150 trailers and cottages were either moved off their foundations or destroyed. Evacuees were sheltered at the First Presbyterian and Methodist Churches. On 7 July, Monday, the areas were still under water and lifeless.

In the city of Milan the river rose so rapidly that campers were forced to flee, leaving cars, boats, trailers and campers to the mercy of the river. In the areas known as Fries Landing, about 100 persons were evacuated by military and civilian personnel and housed in the Sandusky Armory. The Mason Road bridge washed out closing River Road to traffic.

In the community of Monroeville many streets lay under four feet of water for three days. No drinking water was available for two days because the main water line was washed out.

Table I. - Peak stages and discharges at the Huron River gage site.

Date	Stage (ft.)	Discharge		
		c. f. s.	c. f. s. per sq. mi.	
5 Jul 1969	31.1	49,600	133.7	
22 Jan 1959	24.1	25,800	69.5	
12 May 1956	21.1	18,200	49.1	
11 Mar 1952	19.8	13,200	35.6	
4 Apr 1957	18.9	10,500	28.3	
3 Dec 1950	18.6	10,300	27.8	

Figures 1 through 16 show flooding conditions resulting from the July 1969 storm.

The total estimated damages for the July 1969 flood are listed in
table 2. The total estimated damage sustained ~~in~~^{from} the storm and
itemized by the City Manager of Huron is \$3,191,026.00 and includes
only the reach from Mason Road bridge downstream to the mouth.

Table 2. - Estimated damages for the July 1969 flood.

		Estimated damages *	
		: Public	: Boats, Autos:
Flood	: Residential : Commercial : and other : and trailers :	Total	
July 1969:	\$2,040,000 : \$540,000 : \$130,000: \$1,350,000		:\$4,060,000

*** DOES NOT INCLUDE DAMAGES TO ROADS AND
BRIDGES**



Figure 1 - Sunken boats and cars at Holiday Harbor just upstream of Penn Central Co. in Huron.



Figure 2 - Sunken boat and car at Huron Lagoons upstream of Penn Central Co., in Huron.

HURON RIVER, OHIO

Photos taken 8 July 1969



Figure 3 - Aerial view of Wheelers Lagoon Allotment.
Looking westerly at south boundary of Huron City.



Figure 4 - Typical damage in Franklin Flats between
Milan and Huron.

HURON RIVER, OHIO

Photos taken 6&9 July 1969



Figure 5 - Typical damage in Franklin Flats between Milan and Huron. These are foundations from which houses and trailers were washed away.



Figure 6 - Franklin Flats between Milan and Huron. Boy is pointing to July 1969 high water mark.

HURON RIVER, OHIO

Photos taken 9 July 1969



Figure 7 - Typical damage in Franklin Flats between Milan and Huron.



Figure 8 - Looking west along Mason Road at bridge washout. Approximately 2 miles downstream of Milan.

HURON RIVER, OHIO

Photos taken 9 July 1969



Figure 9 - Looking northwest at flood waters in Milan, Ohio. Water is flowing from upper left to lower right of picture. U. S. Route 250 in background. Old River bridge in center of photo was washed out.



Figure 10 - Looking southeast at flood waters in Milan, Ohio. Old Route 250 is in foreground and Old River Road is in the center. Water flows from lower right to upper left of photo.

U. S. DEPT. OF COMMERCE

Photo taken on May 20, 1937



Figure 11 - Looking at washed out section of Old River Road bridge in Milan. Note gage at right side of photo was covered with water.



Figure 12 - Looking downstream from U.S. Route 250 at Old River Road bridge in Milan, Ohio. Both approaches were completely washed away and the bridge was severely damaged and will probably not be repaired.

HURON RIVER, OHIO

Photos taken 9 July 1969



Figure 13 - Typical road washout on the West Branch at Huber Road.



Figure 14 - Typical shoulder damage on the East Branch at U.S. Route 20.

HURON RIVER, OHIO

Photos taken 9 July 1960

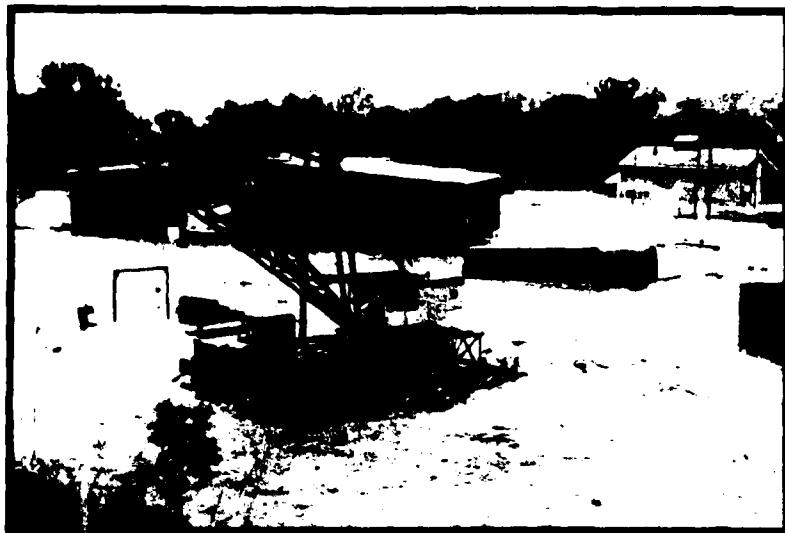


Figure 15 - Looking downstream from U. S. State Route 250
at Milan Steel and Bagley Lumber Co.



Figure 16 - Looking at upstream face of U. S. State Route 250
bridge.

HURON RIVER, OHIO

Photos taken 5 July 1969

NORWALK CREEK, OHIO

Confluence with East Branch of Huron River through city of Norwalk

For many residents in the city of Norwalk, a community of about 14,000, the "flood of July 1969" was an unforgettable experience.

At about 9:30 a.m. on 5 July the water supply reservoir for the city was breached, sending millions of gallons of water into the downtown area. Following collapse of the reservoir wall, Norwalk Creek became an unnatural river several hundred feet wide cutting off the city and eliminating traffic on all major north and south arteries. The only major highway open to the city was U. S. 20.

The flooded area through the city of Norwalk is shown on plate 12.

The municipal water supply for Norwalk is contained in three reservoirs - The Lower, Upper and Memorial Reservoir. All reservoirs are earth embankments and only the Memorial Reservoir has a concrete spillway section. Water began to flow over the west embankment of the Lower Reservoir and quickly eroded a section about 100 feet wide and 20 feet deep. This reservoir holds several million gallons of water and also supplies cooling water for the steam power generating plant. When the reservoir was drained the power plant became inoperative leaving the city with no domestic water supply or power.

Two officials of the power plant felt that the break in the Lower Reservoir was caused by overflow from "Bauer's Pond." The pond

overflowed during the heavy rains on the evening of 4 July (it has been estimated that 12 inches fell in a 13-hour period) and flowed down the Norfolk and Western Railway tracks into the Lower Reservoir. This they felt overtaxed the reservoir and caused the break. Under normal conditions the water from the pond drains into the Upper Reservoir.

Construction crews began repair of the Lower Reservoir in the evening of 5 July. Driving of steel sheet piling began on Sunday and was finished Tuesday. A steel sheet piling wall was driven across the break in the old masonry wall buried beneath the earth fill. The construction crews worked around the clock and minimal water and electrical service was returned by the weekend. Residents were warned by county health officials to boil all drinking water to eliminate any possibility of contamination. The county health department had found some contamination in certain areas of the city. Although water leaving the filtration plant was free of contamination, there were many breaks and leaks in the water lines from the plant to the users.

About 130 National Guardsmen based in Akron were on duty late Saturday to prevent looting in the darkened city, enforce evening curfews and control traffic movement into and out of the city. On Wednesday, 9 July, the curfew was lifted.

The Red Cross prepared over 6,000 meals at the disaster center (Norwalk Junior High School) for workmen repairing the damage to the reservoir, local area law enforcement officers, and National Guardsmen. Much of the food and supplies was donated by local residents and businessmen.

The Elm Street bridge, although cracked, remained in service. Benedict Avenue, Pleasant Street and Old State Road were washed away. Norfolk and Western Railway Company officials reported that due to extensive washouts of railroad embankments, transportation between Brewster and Norwalk was curtailed.

The Ohio State Route 61 armory was flooded with up to six feet of water. All weapons and vehicles were completely submerged. Trucks and other equipment were evacuated to Camp Perry for repairs. The rifle range in the lower wing of the building was completely flooded. A small maintenance building on the grounds collapsed and was destroyed.

Fifty camping trailers and 16 cars at the Valley Beach Swim Park were engulfed by tiny Cole Creek, a tributary to East Branch of Huron River. The creek is normally only a few feet deep but early Saturday morning the stream measured up to 25 feet deep in places. About half of the camping trailers were completely destroyed. About 60 persons were housed in temporary quarters set up in the Norfolk Community Center.

There is shown on plate 12 the area inundated by the July 1969 flood. Also shown on this plate is the water surface profile which was reconstructed from high-water marks obtained by Buffalo District personnel shortly after the high water occurrence.

Figures 17 through 28 show flooding conditions for the July 1969 storm.

The total estimated damages for the July 1969 flood are listed in table 3.

Table 3. - Estimated damages for the July 1969 flood.

Stream	Estimated damage						Total	
				Boats, Public & Trailers:				
	Residential	Commercial	Other	& Cars				
Norwalk Creek:	\$ 50,000	\$ 550,000	\$ 860,000(1)				\$ 1,460,000	
Cole Creek	-	-	-				\$ 250,000	

(1) Includes \$520,000 for repair of Lower Reservoir. Does not include damages sustained by Norfolk and Western Railway Company.



Figure 17 - Damage in camping area on Cole Creek.



Figure 18 - Looking upstream at Pleasant Street culvert washout.

COLE CREEK, OREGON

Geological Survey Professional Paper 1000

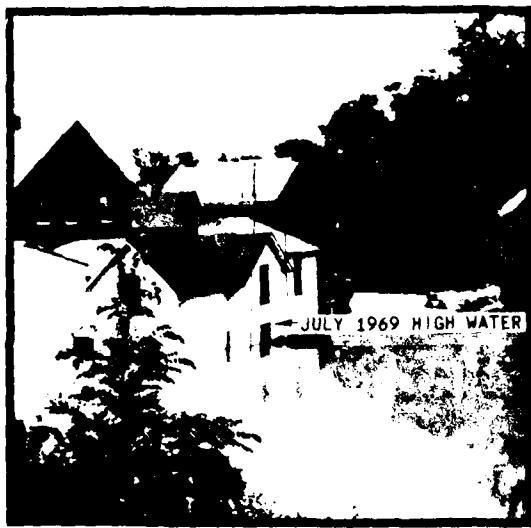


Figure 19 - Looking at rear of residence on West Water Street. Water was 7.4 feet deep on first floor at the peak of the flood.



Figure 20 - Looking at rear of apartment house on West Water Street and lumber storage shed. Water was 7.0 feet above first floor of apartment building at the peak of the flood.

MORGAN COUNTY, ILLINOIS

Photos taken by July 1, 1969



Figure 21 - Looking upstream across Benedict Avenue.
Note difference in water surface elevations on building at left of photo.



Figure 22 - Washout between railway depot and
building on Benedict Avenue.

NORWALK CREEK, OHIO

Photos taken 5&6 July 1969



Figure 23 - Looking downstream from Benedict Avenue at railroad washout along the right bank. Photo taken 6 July 1969.



Figure 24 - Looking southerly along Benedict Avenue during rescue operations. The nose of the truck was eventually covered with water. Photo taken 6 July 1969.

SCHWALF CELLS, LTD.



Figure 25 - Submerged tractor and trailer on the upstream side of Linwood Avenue. There is more equipment under water which is not visible because of the high water. Photo taken 5 July 1969.



Figure 26 - Flooding in the Elm Street residential area. Photo taken 5 July 1969.

NORWALK CREEK, OHIO



Figure 27 - Looking at break in Lower Reservoir. Car in photo was destroyed. Photo taken 5 July 1969.



Figure 28 - Looking at break in Lower Reservoir after water escaped. Photo taken 6 July 1969.

NORWALK CREEK, OHIO

The following is a tabulation of data, on the July 1969 flood,
 collected by the Ohio Department of Natural Resources, Division of water,
 for areas not covered by a flooded area map or profile in this report.

WEST BRANCH - HURON RIVER

Location	Approximate Channel Bottom	Low Steel	Approximate Low Water	July 1969 (1) High Water Mark
Terry Road	723.4	735.8	724.2	d.s. 739.43 u.s. 739.45
Peru West Road	737	749.1	739.1	u.s. 750.54

EAST BRANCH - HURON RIVER

Remell Road	717.9	728.1	719.7	d.s. 734.0
Townline Road	770.5	778.4*	771.5	d.s. 782.35
Ridge Road	791.2	796.1*	791.7	u.s. 800.66
Peru Olena Road	798.7	806.4*	799.0	u.s. 806.83

(1) u.s. - upstream of bridge
 d.s. - downstream of bridge
 * Approximate - bridge washed out

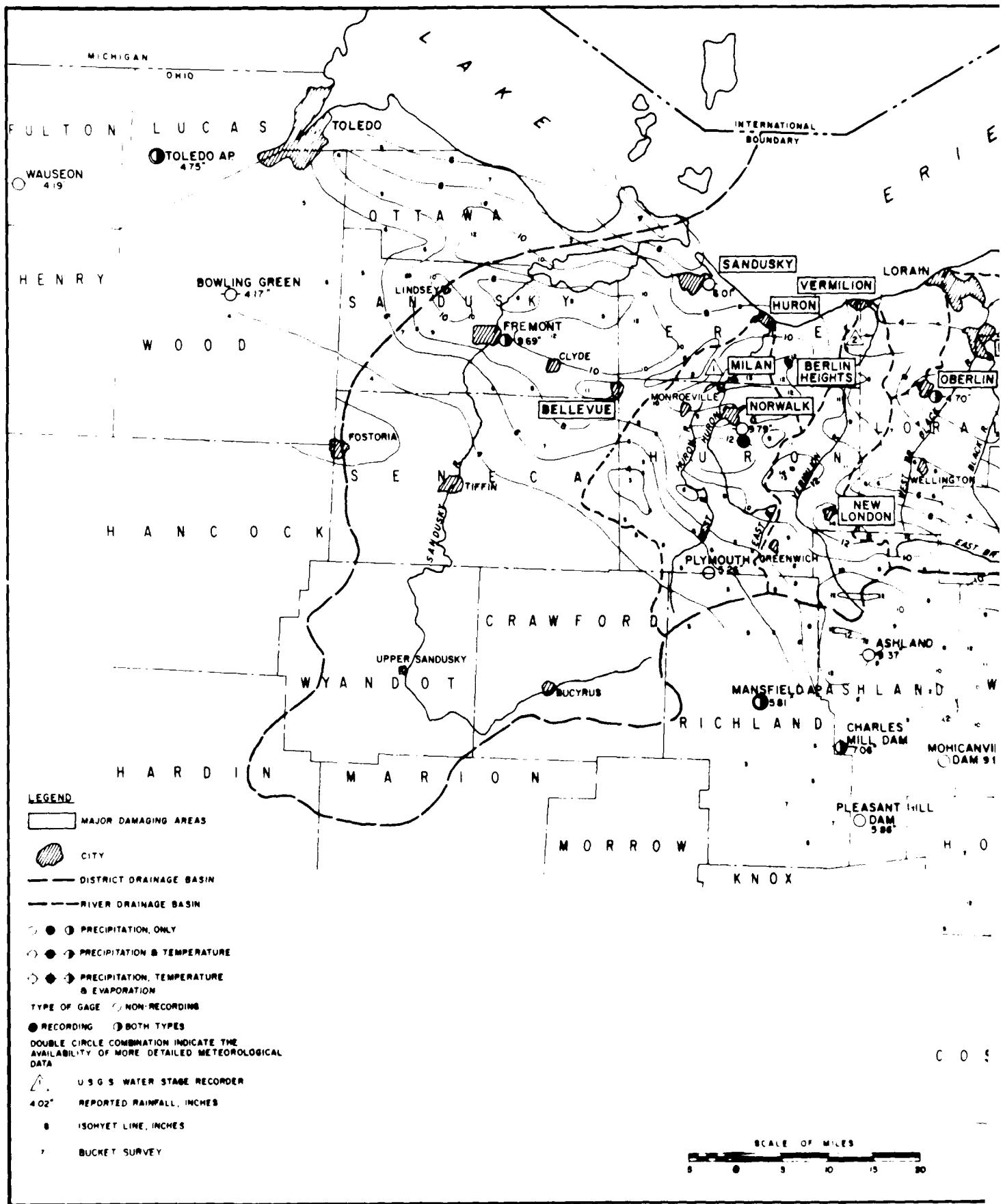
SOUTH BRANCH - NORWALK CREEK

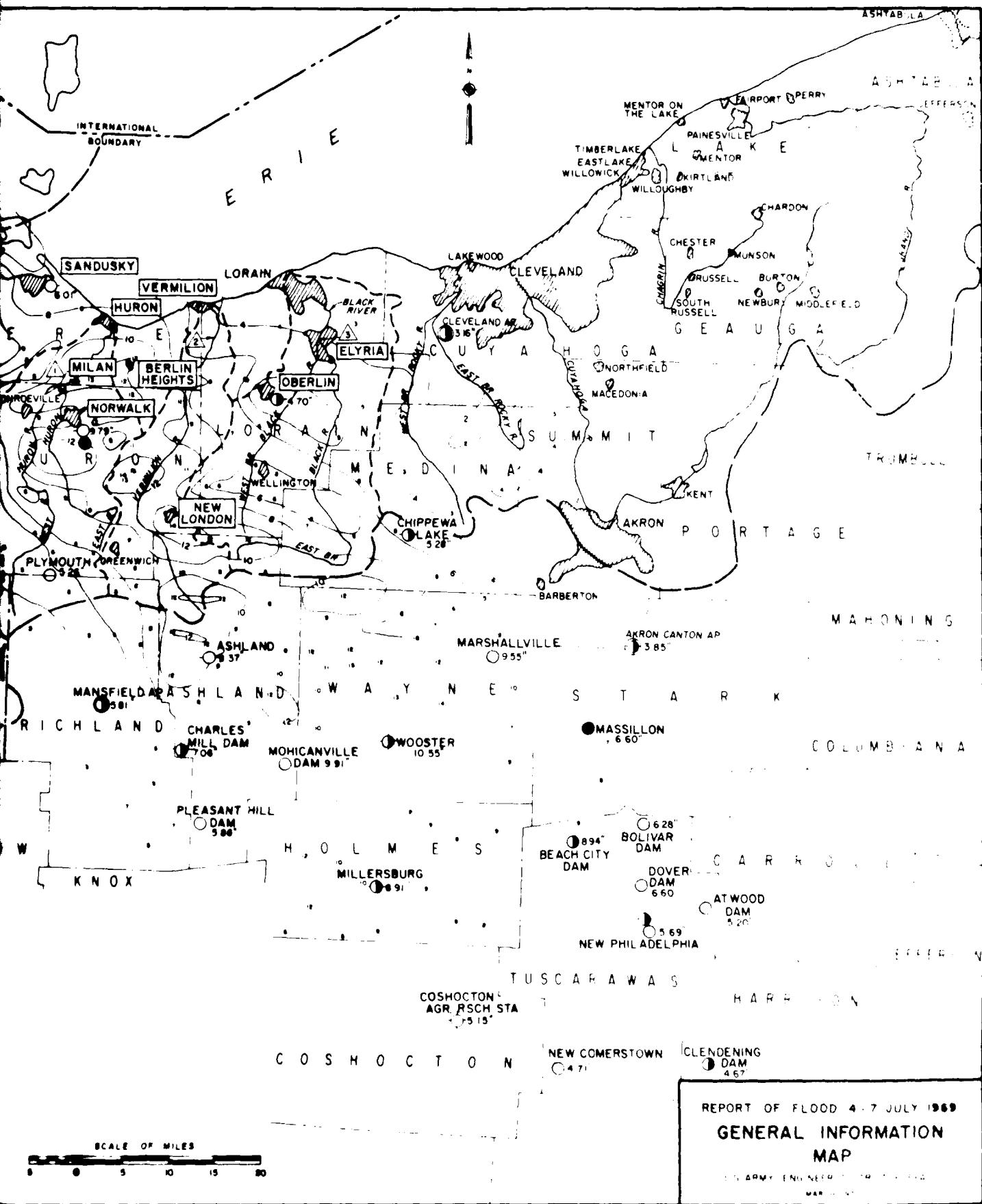
Townline Road	666	685.8	667.4	d.s. 690.11
Ridge Road	710	723.6	711.7	u.s. 735.79
South Norwalk Road	729	742.1	730.5	d.s. 752.27

COLE CREEK

Townline Road	665.0	685.0	666.6	d.s. 690.00 u.s. 690.02
Ridge Road	734.9	754.2	735.4	u.s. 756.82
Hasbrock Road	742	755.8	744	d.s. 756.93 u.s. 759.65
Ridge Road	749	757.3	749.8	d.s. 762.50 u.s. 762.57

(1) u.s. - upstream of bridge
 d.s. - downstream of bridge





REPORT OF FLOOD A-Z JULY 1933

GENERAL INFORMATION

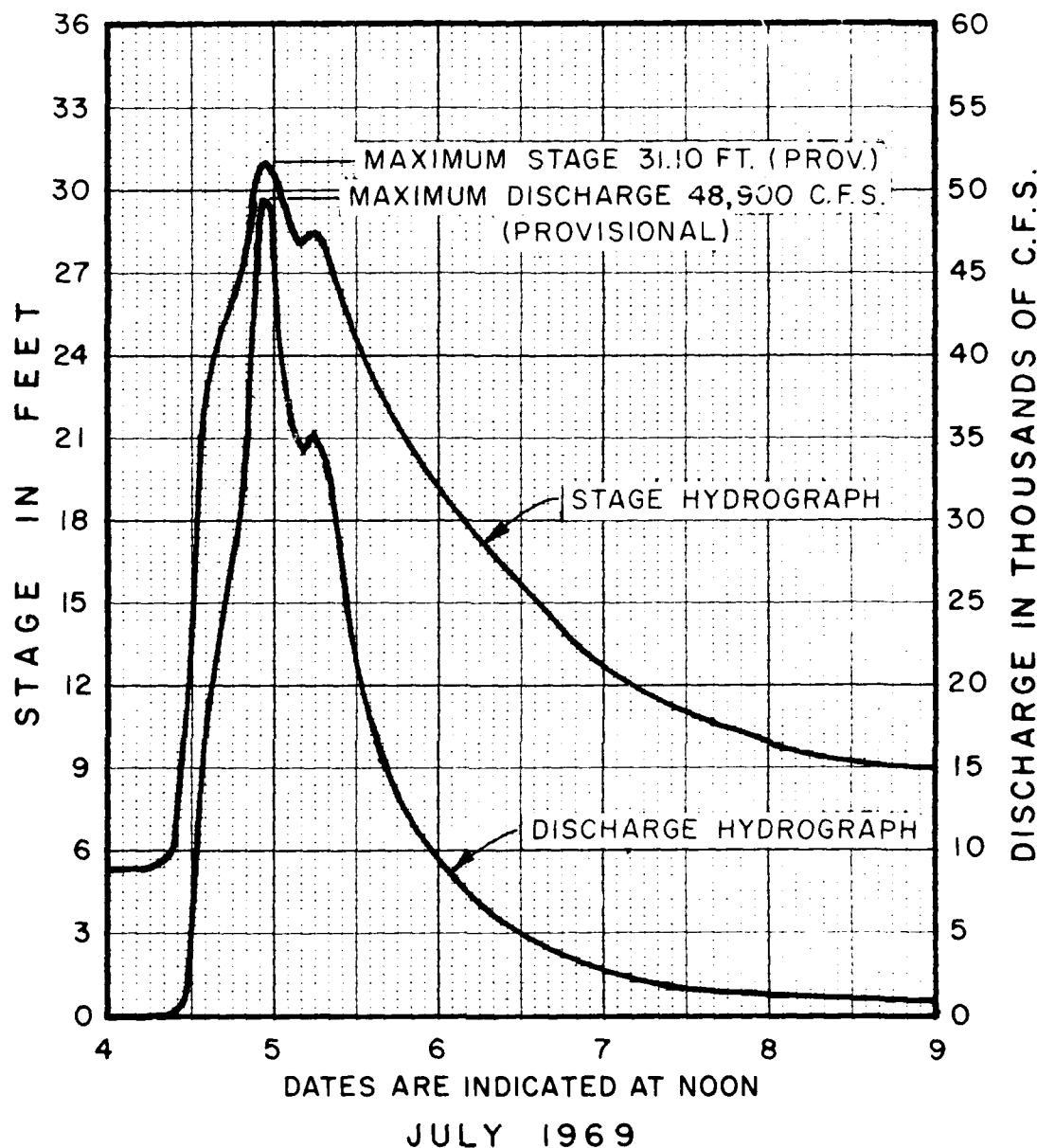
MAP

U. S. ARMY ENGINEER DEPARTMENT

SCALE OF MILES

• 5 10 15 20

PLATE



NOTES:

ZERO OF GAGE = 572.93
U.S.C. & G.S. DATUM

DRAINAGE AREA = 371
SQUARE MILES.

REPORT OF FLOOD 4-7 JULY 1969
HURON RIVER

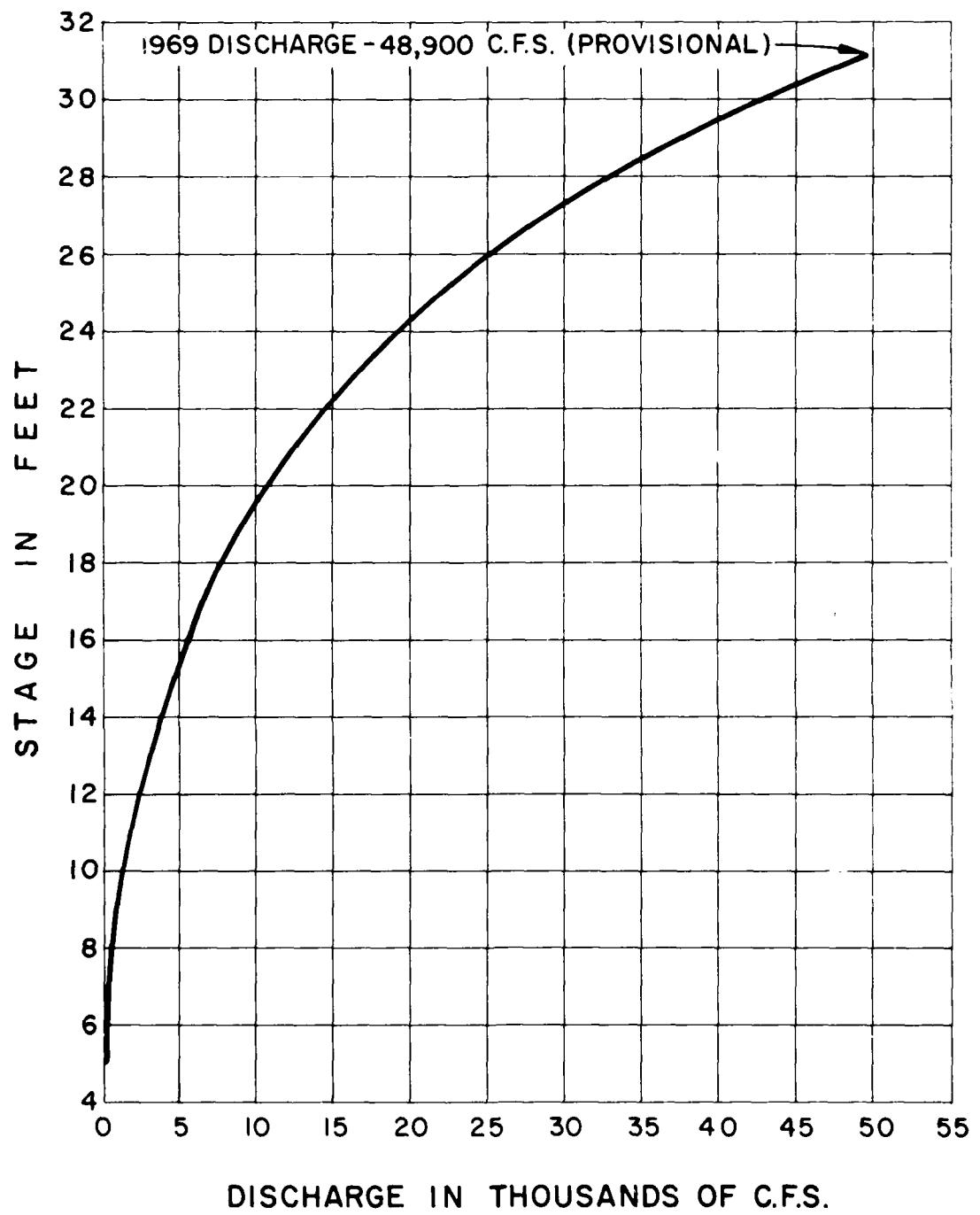
STAGE & DISCHARGE HYDROGRAPHS

U.S.G.S. GAGE AT
MILAN, OHIO

U. S. ARMY ENGINEER DISTRICT, BUFFALO

MARCH 1970

PLATE 2



STATION DATA

ZERO OF GAGE = 572.93 U.S.C.G.S.
DATUM.

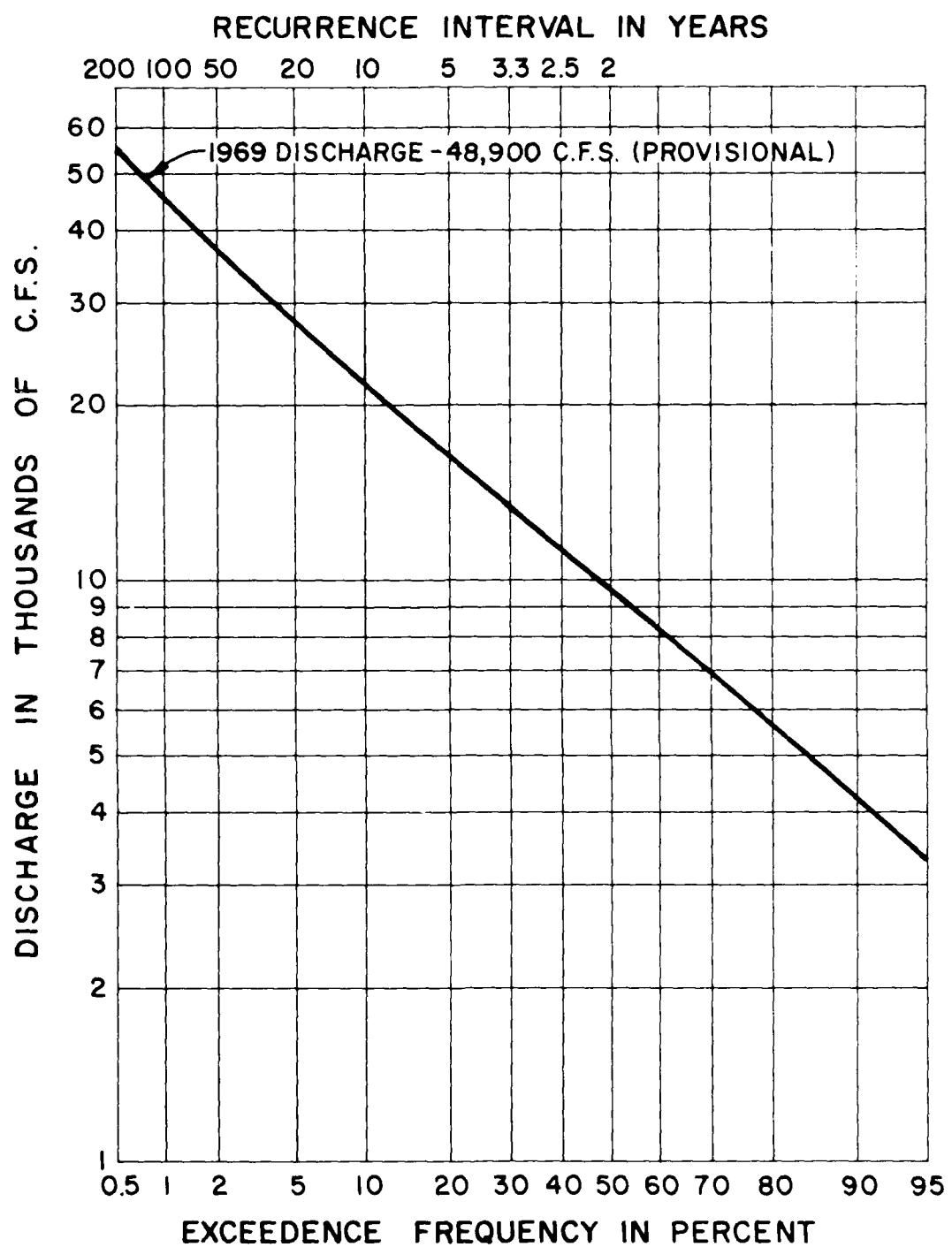
REPORT OF FLOOD 4-7 JULY 1969

HURON RIVER

STAGE-DISCHARGE CURVE

U.S.G.S. GAGE AT
MILAN, OHIO

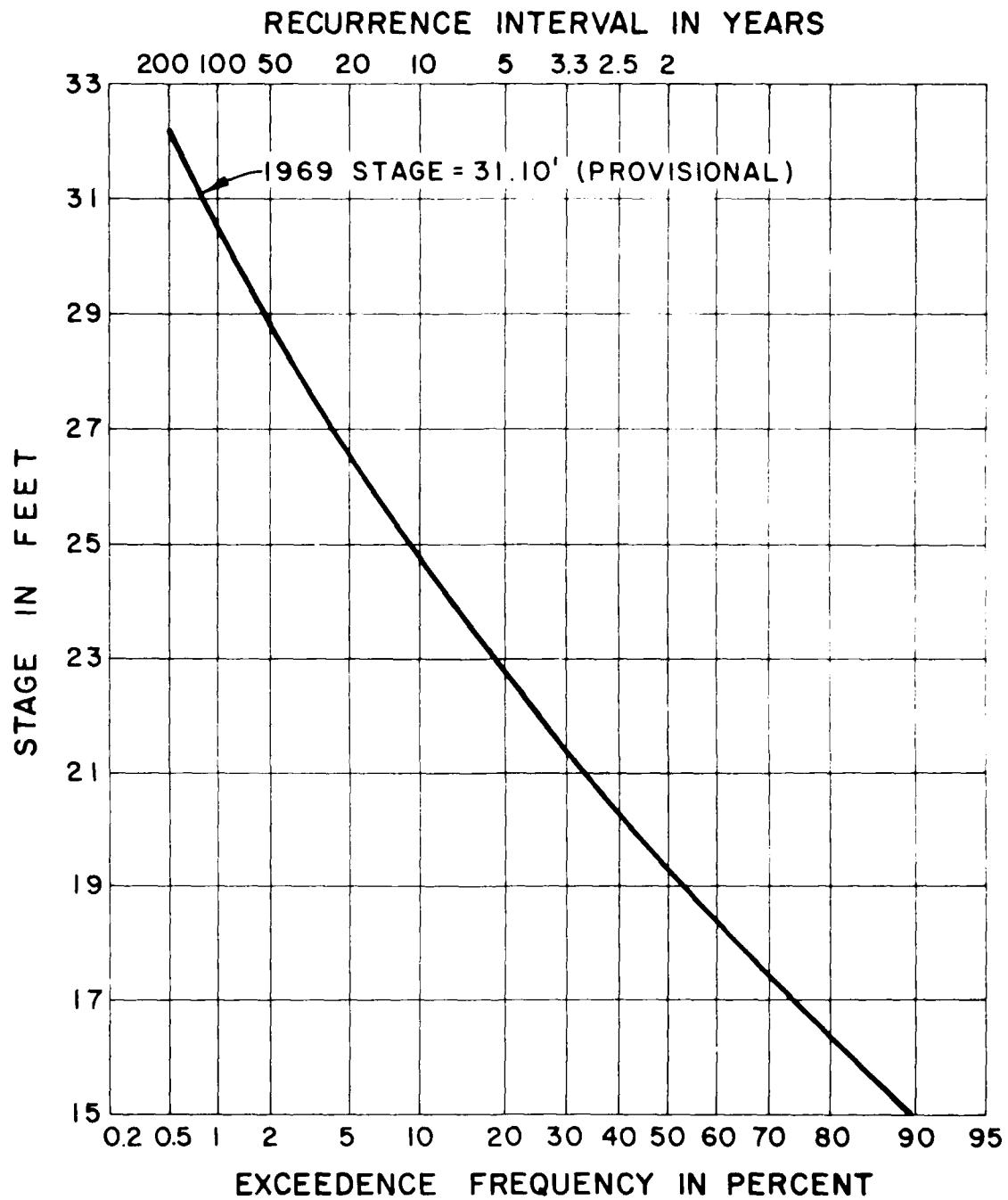
U.S. ARMY ENGINEER DISTRICT, BUFFALO
MARCH 1970



NOTE:

DRAINAGE AREA = 371
SQUARE MILES.

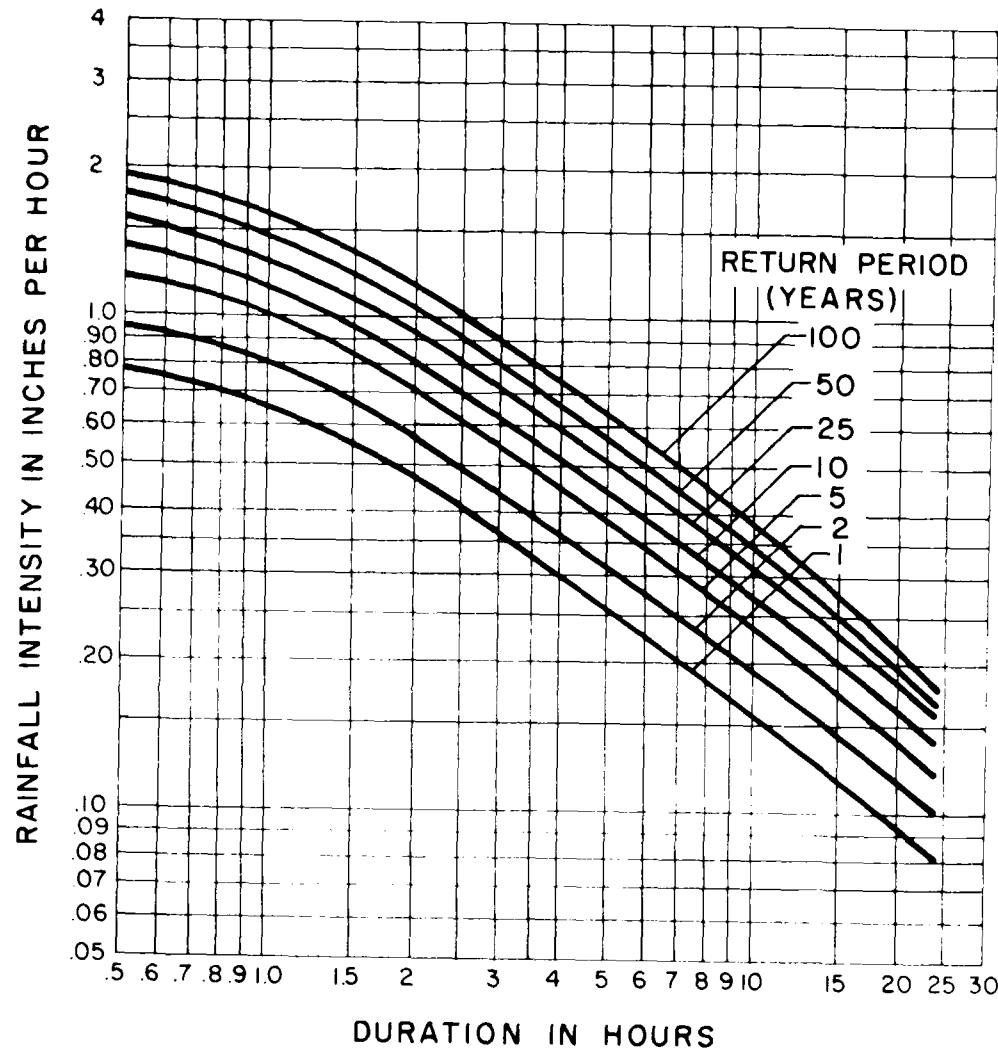
REPORT OF FLOOD 4-7 JULY 1969
HURON RIVER
DISCHARGE-FREQUENCY CURVE
U.S.G.S. GAGE AT
MILAN, OHIO
U. S. ARMY ENGINEER DISTRICT, BUFFALO
MARCH 1970



NOTES:

ZERO OF GAGE = 572.93
U.S.C. & G.S. DATUM
DRAINAGE AREA = 371
SQUARE MILES.

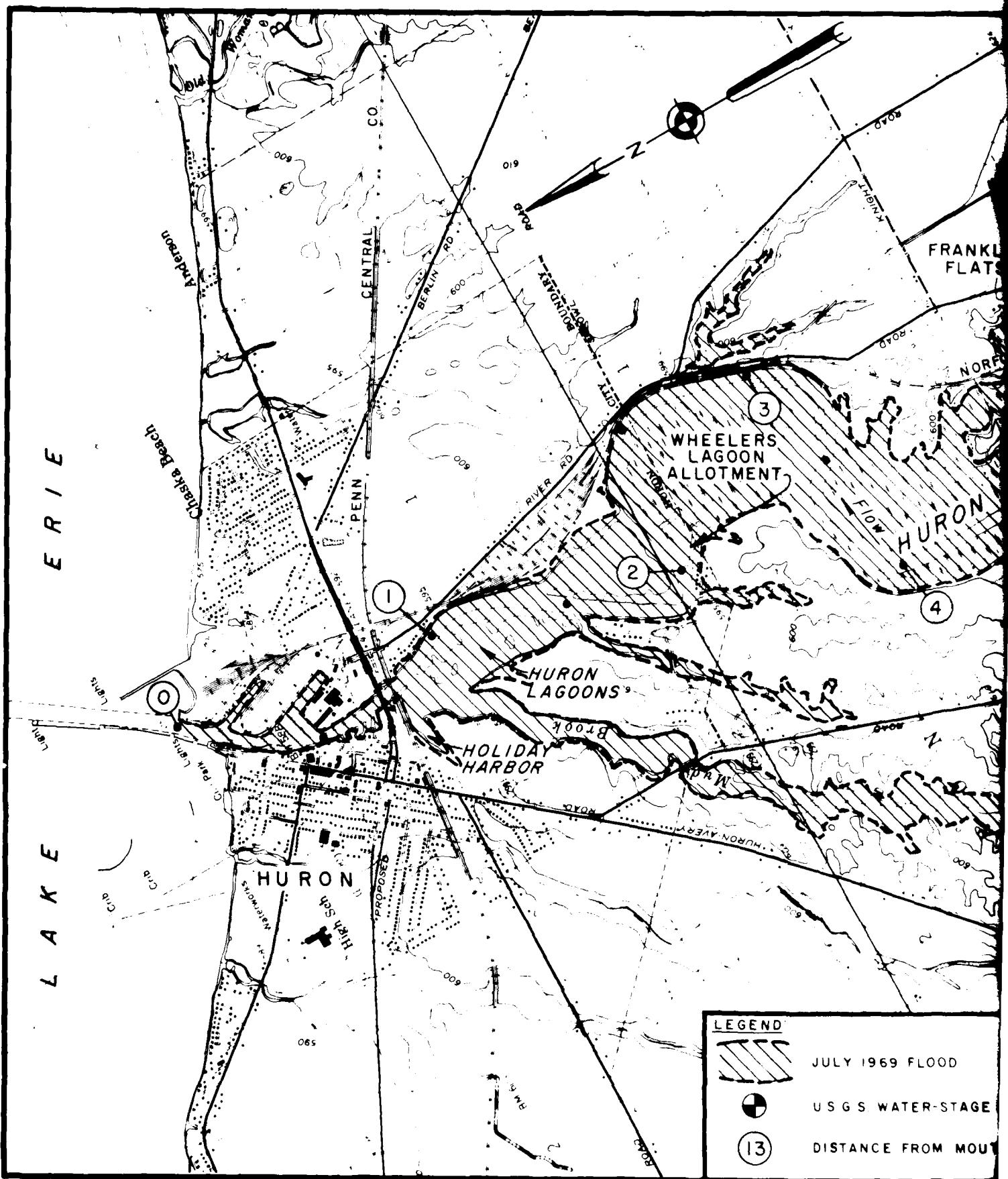
REPORT OF FLOOD 4-7 JULY 1969
HURON RIVER
STAGE - FREQUENCY CURVE
U.S.G.S. GAGE AT
MILAN, OHIO
U.S. ARMY ENGINEER DISTRICT, BUFFALO
MARCH 1970

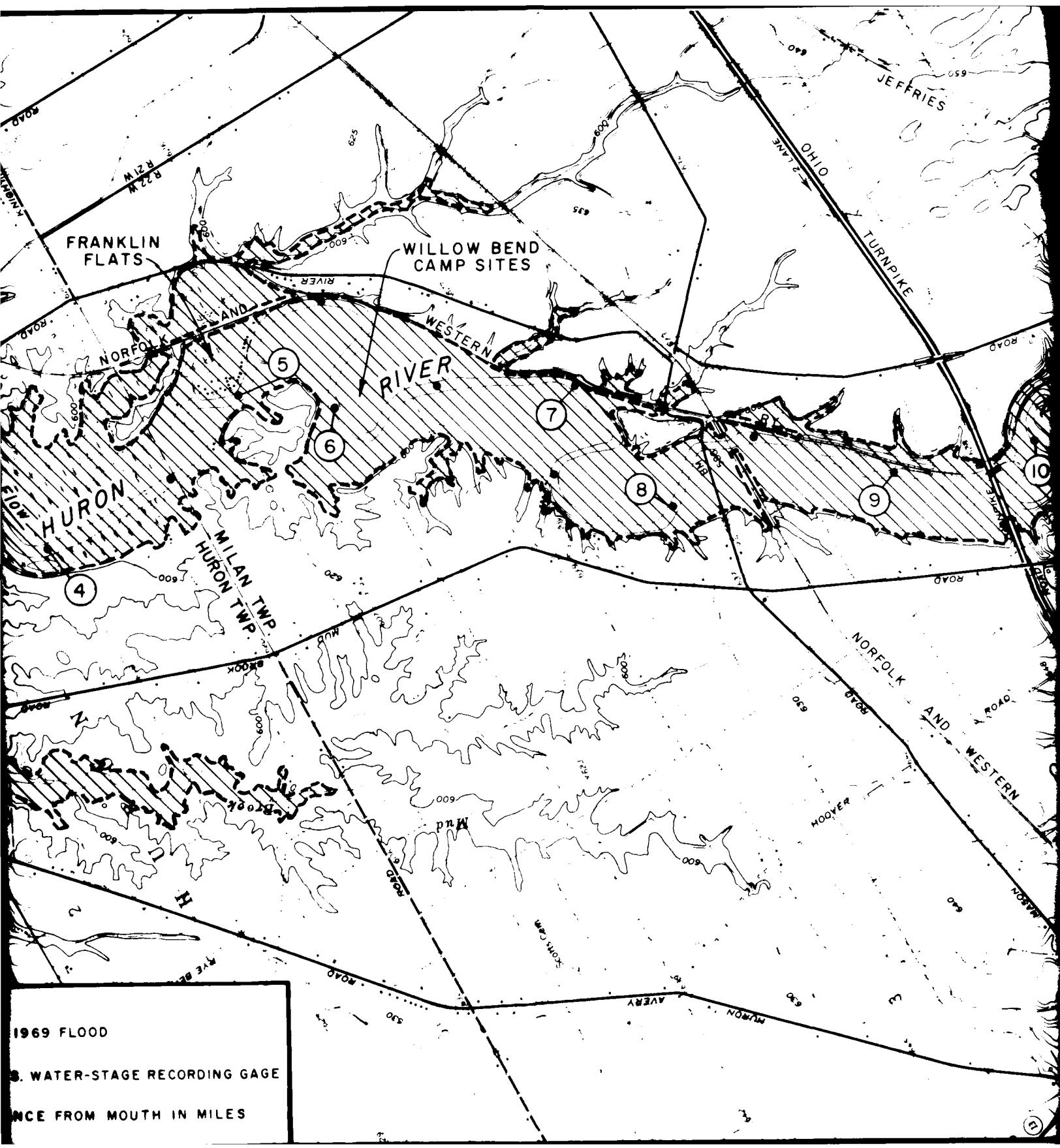


NOTE:

DERIVED FROM U.S. WEATHER
BUREAU TECHNICAL PAPER
NO. 40 "RAINFALL FREQUENCY
ATLAS OF THE UNITED STATES"

REPORT OF FLOOD 4-7 JULY 1969
HURON RIVER
RAINFALL INTENSITY-DURATION
FREQUENCY CURVES
U.S. ARMY ENGINEER DISTRICT, BUFFALO
MARCH 1970

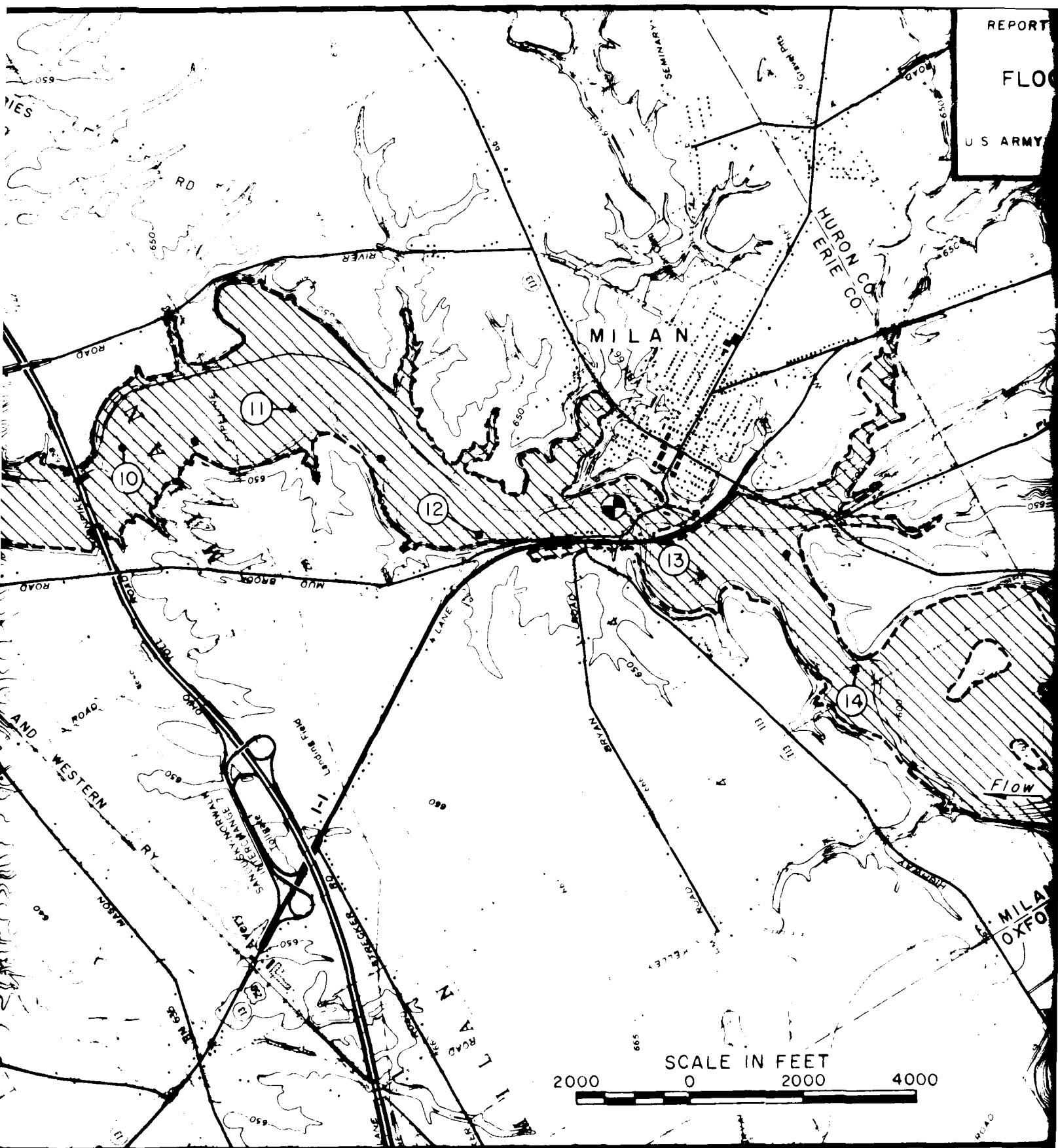




REPORT

FLOOD

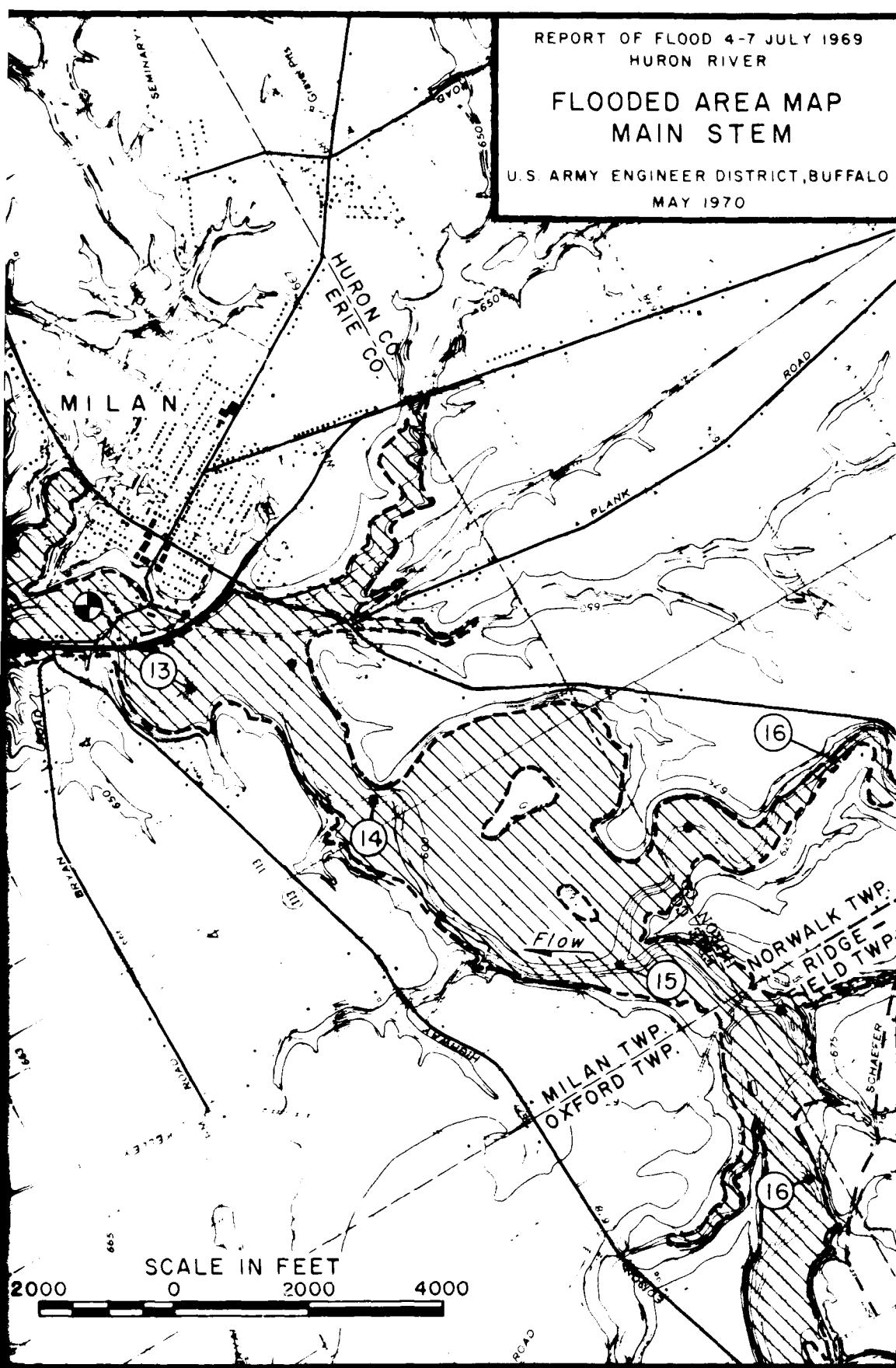
U.S. ARMY

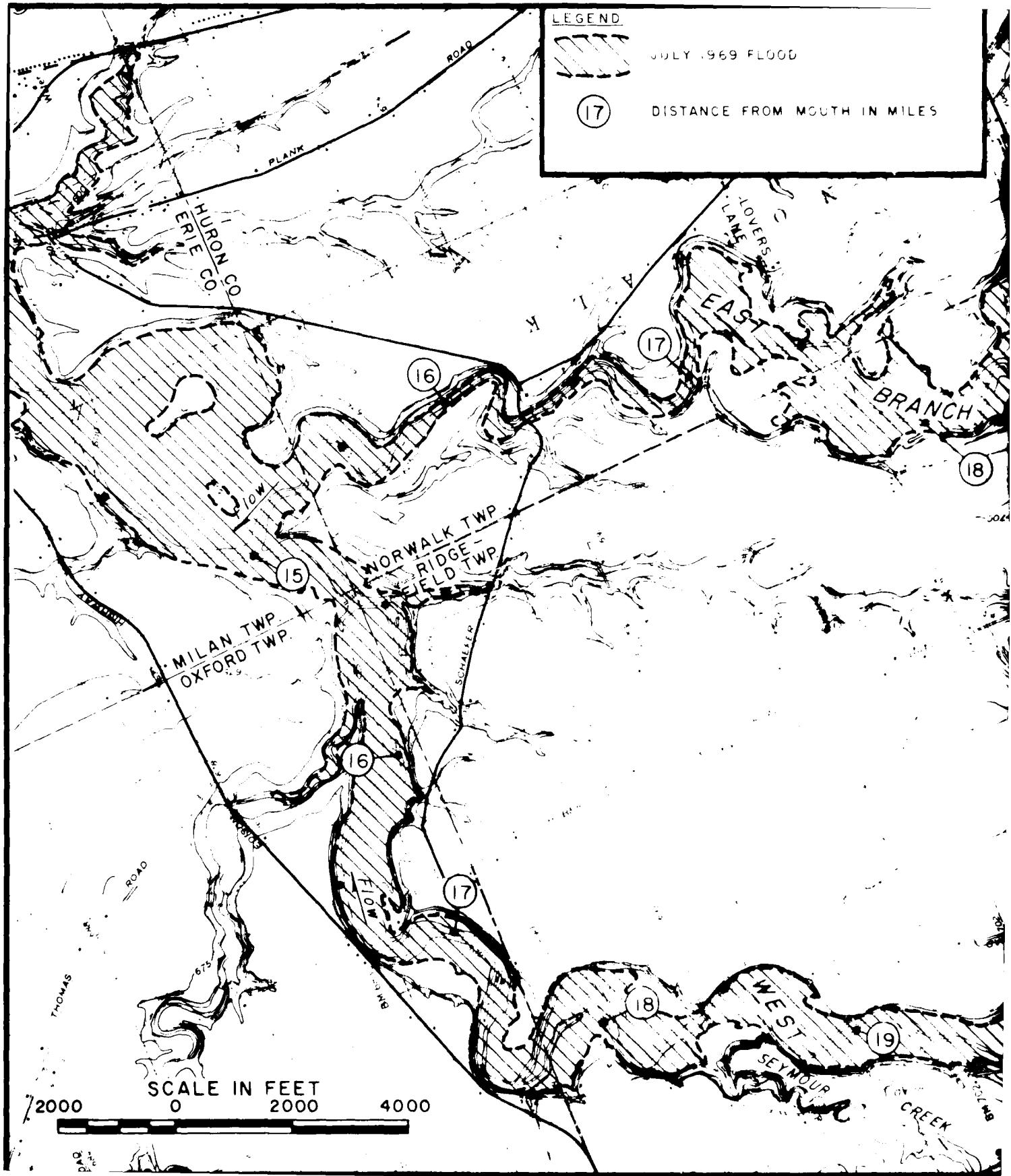


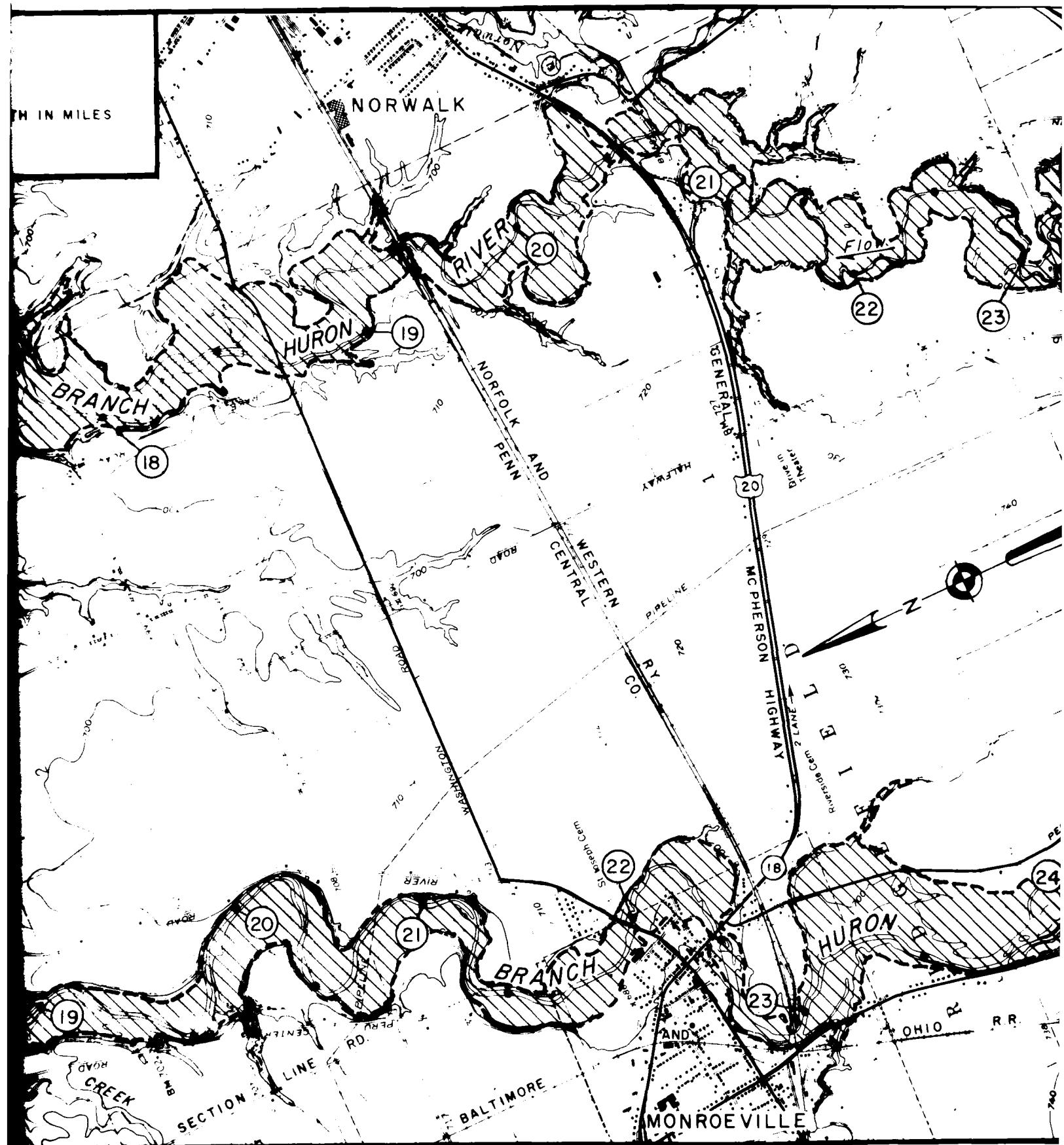
REPORT OF FLOOD 4-7 JULY 1969
HURON RIVER

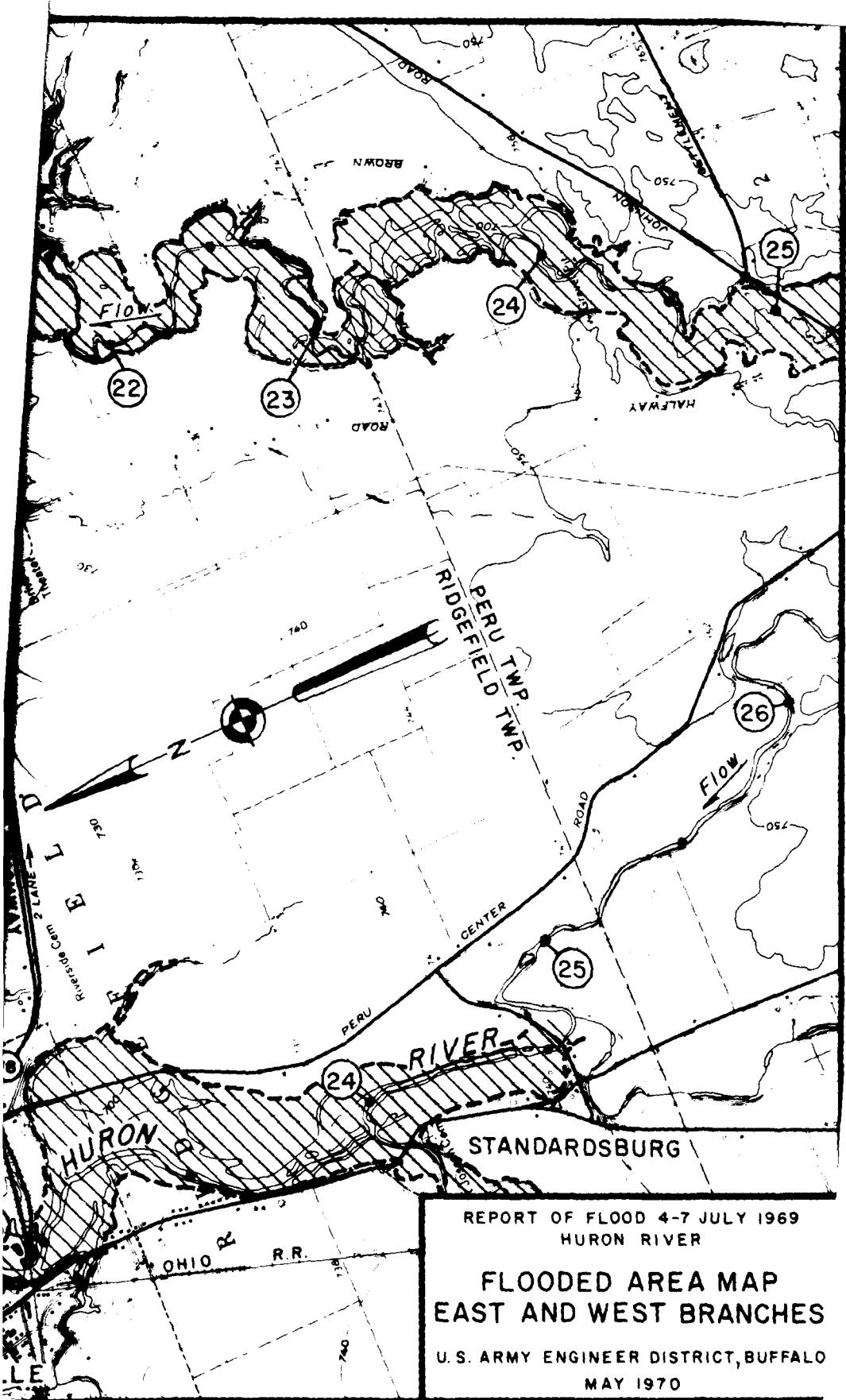
FLOODED AREA MAP
MAIN STEM

U.S. ARMY ENGINEER DISTRICT, BUFFALO
MAY 1970

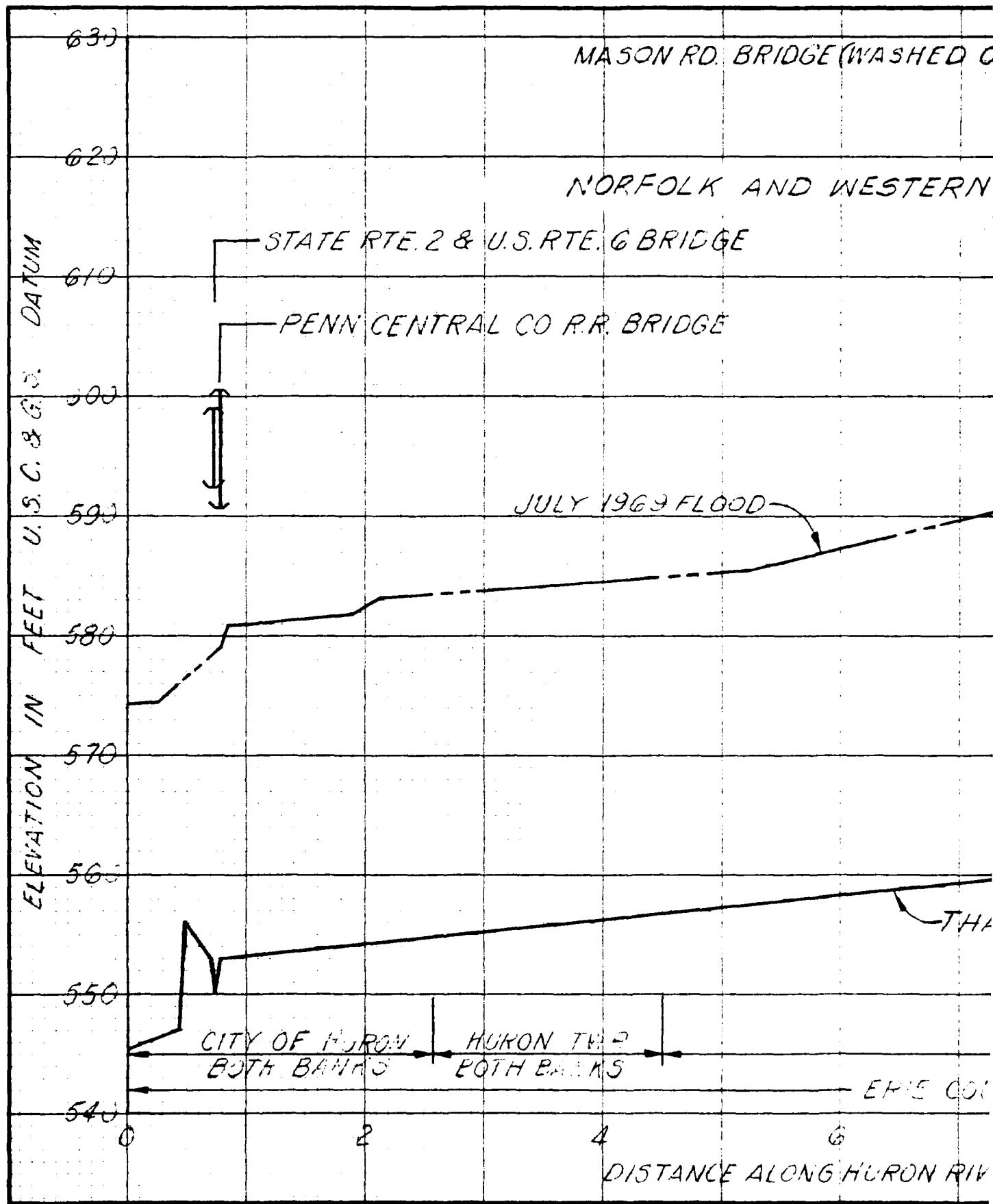


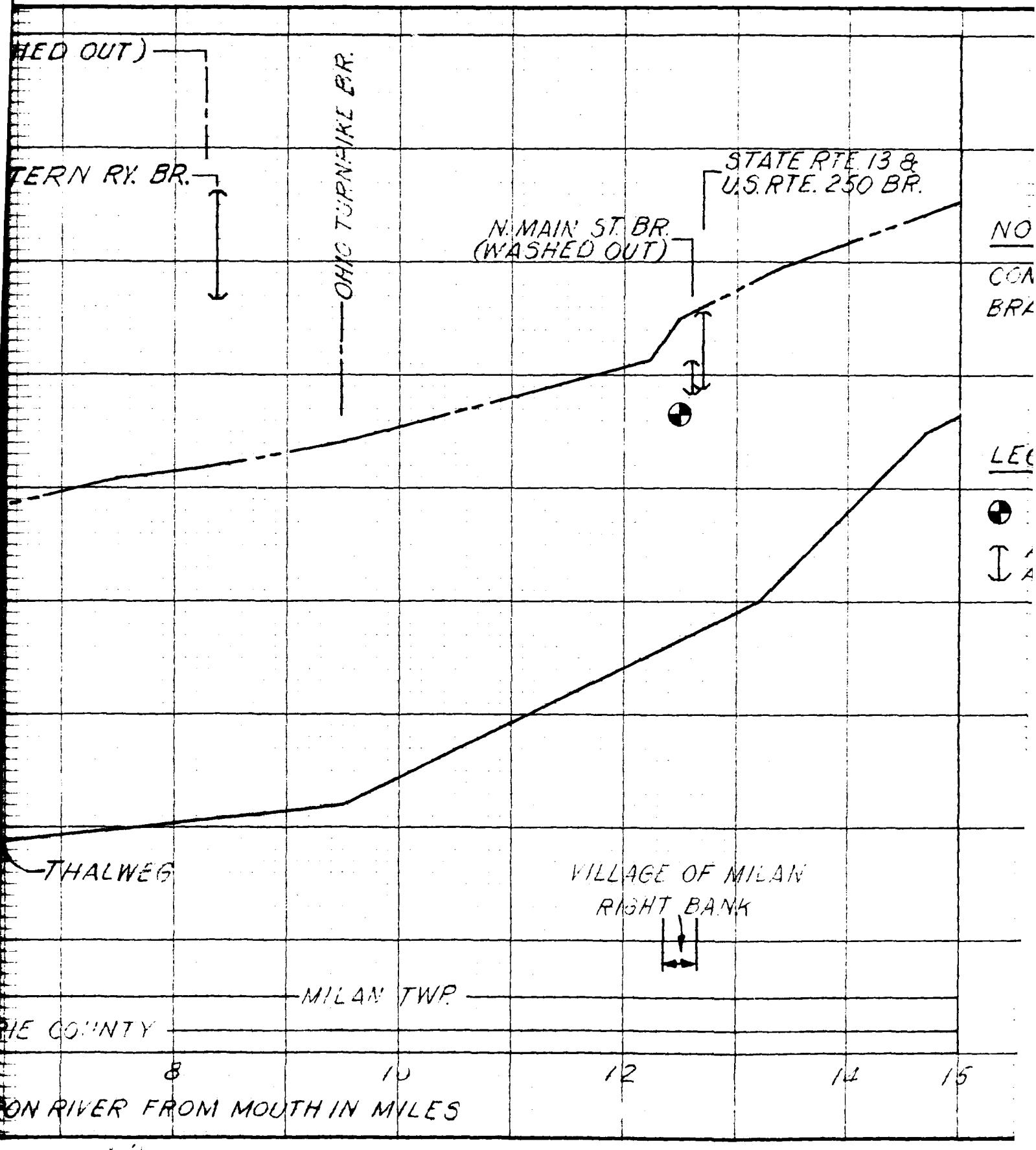






PLATE





RTE 13 &
E. 250 BR.

NOTE:

CONFLUENCE OF EAST & WEST
BRANCHES OCCURS AT MILE 15

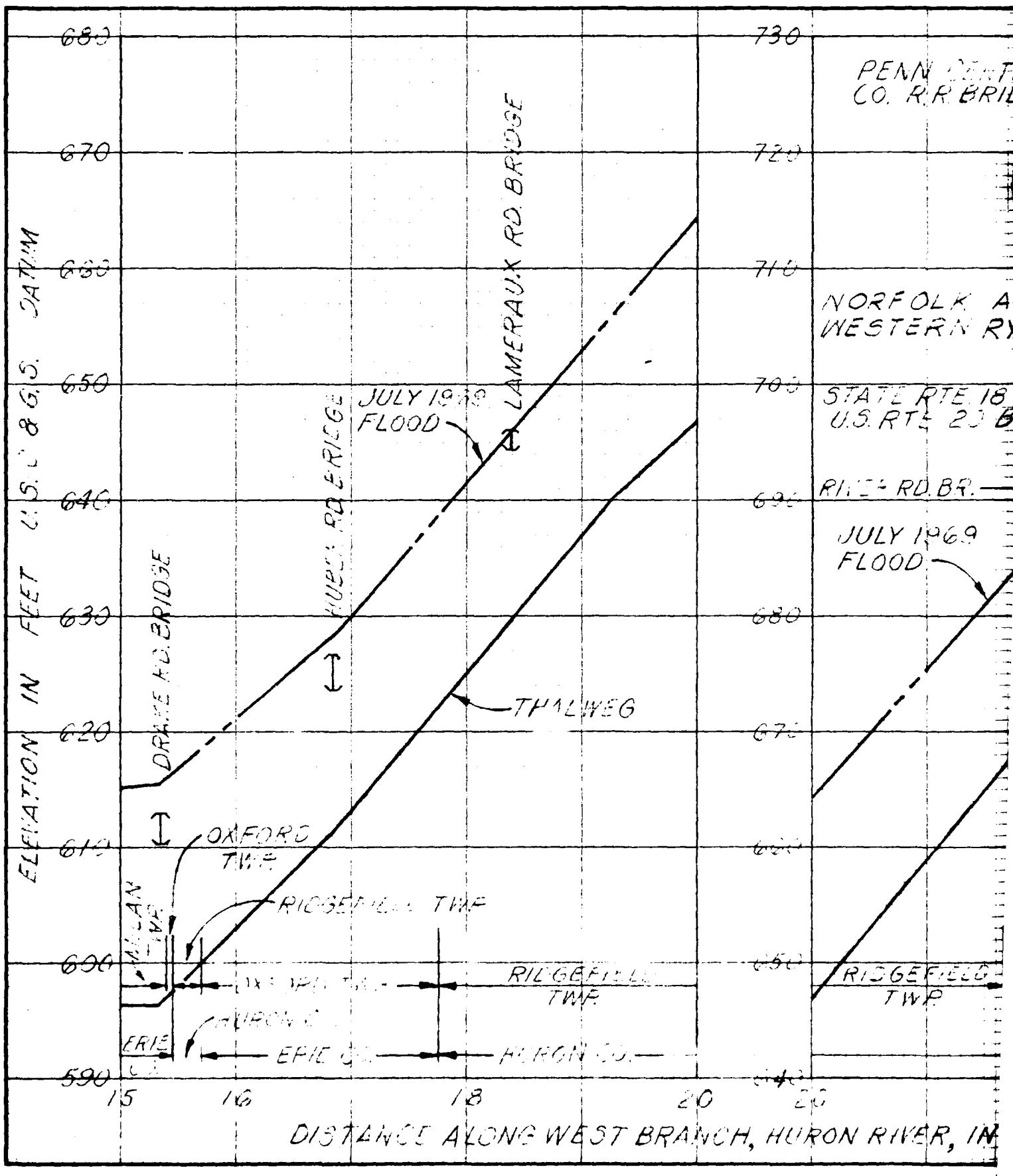
LEGEND

- EXISTING GAGE LOCATION
- ↑ APPROXIMATE ROADWAY ELEVATION
- ↓ APPROXIMATE LOW STEEL ELEVATION

REPORT OF FLOOD 4-7 JULY 1969
HURON RIVER
WATER SURFACE PROFILE
MAIN STEM
U. S. ARMY ENGINEER DISTRICT, BUFFALO
MARCH 1970

14 15

PLATE 9



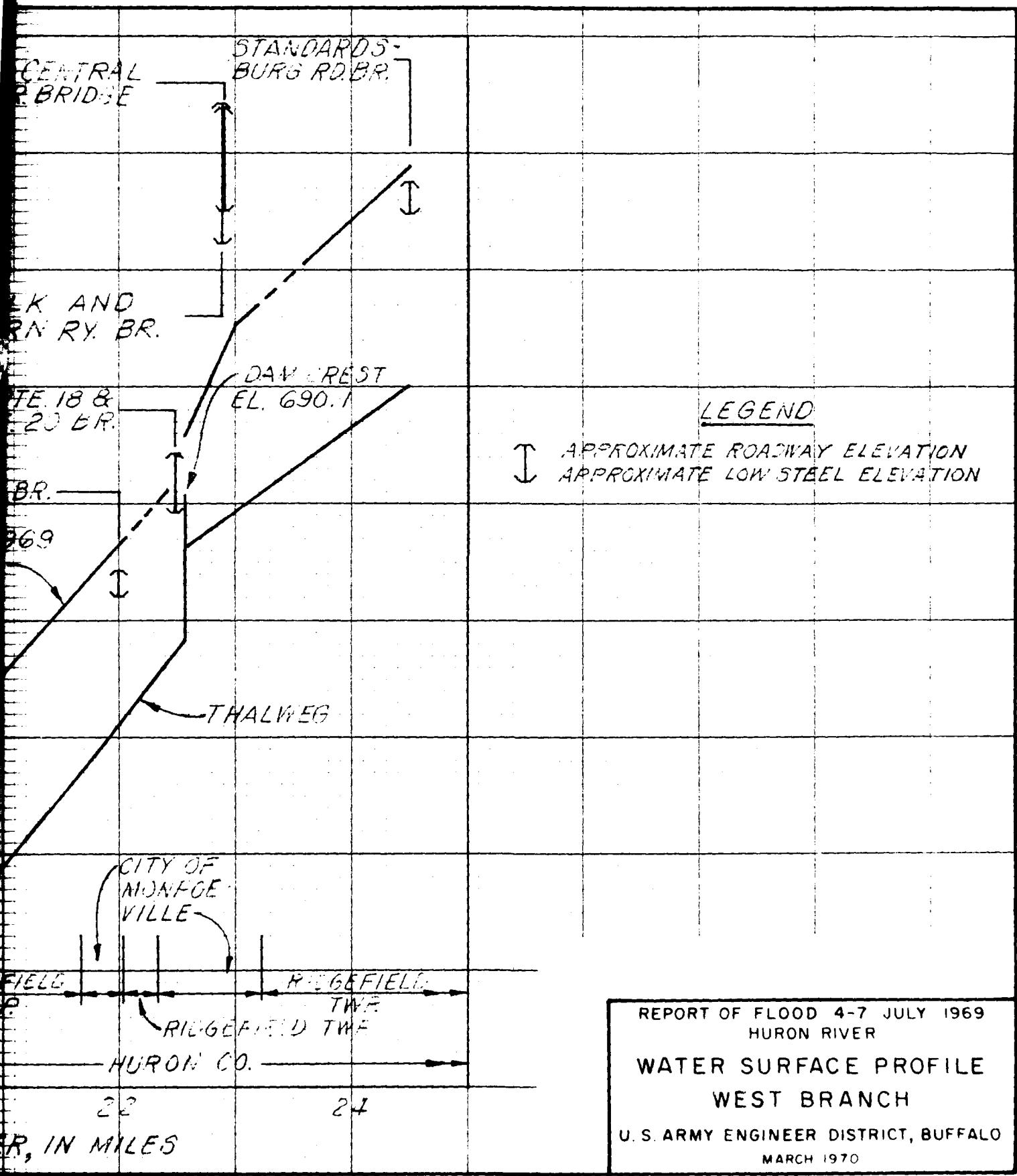
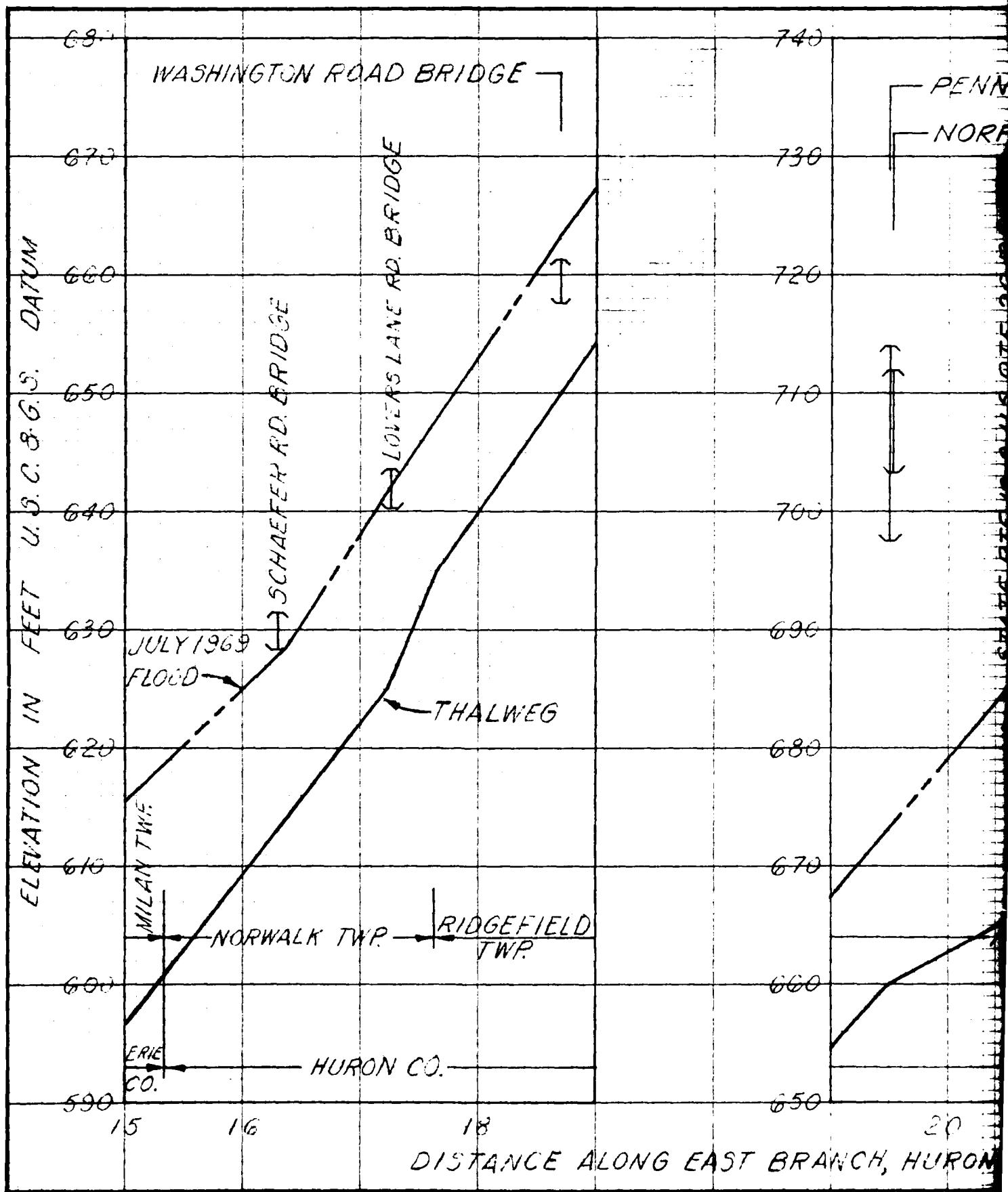
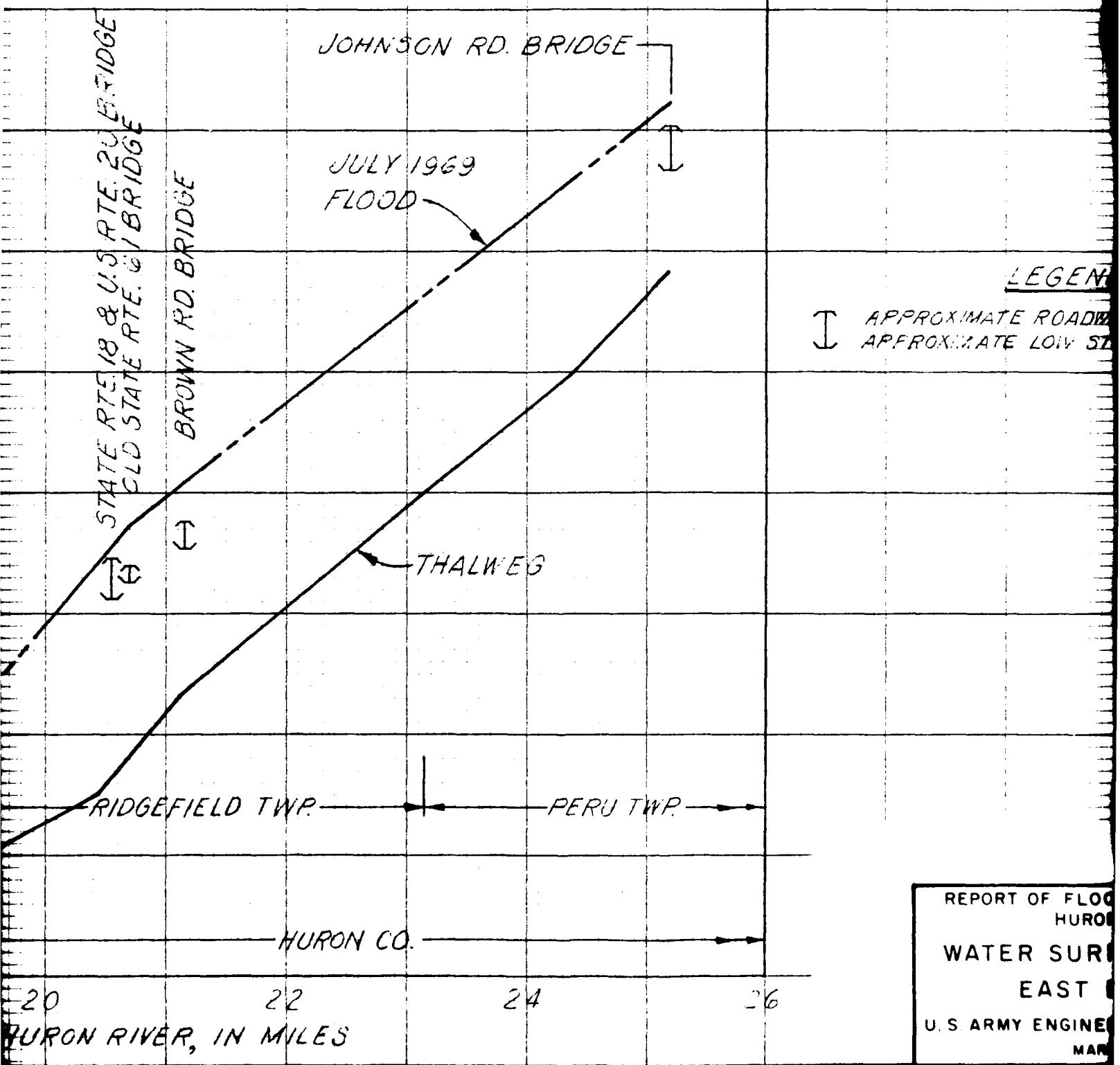


PLATE 10



-PENN CENTRAL CO. RR. BRIDGE
-NORFOLK AND WESTERN RY.



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APPROXIMATE ROADWAY ELEVATION
APPROXIMATE LOW STEEL ELEVATION

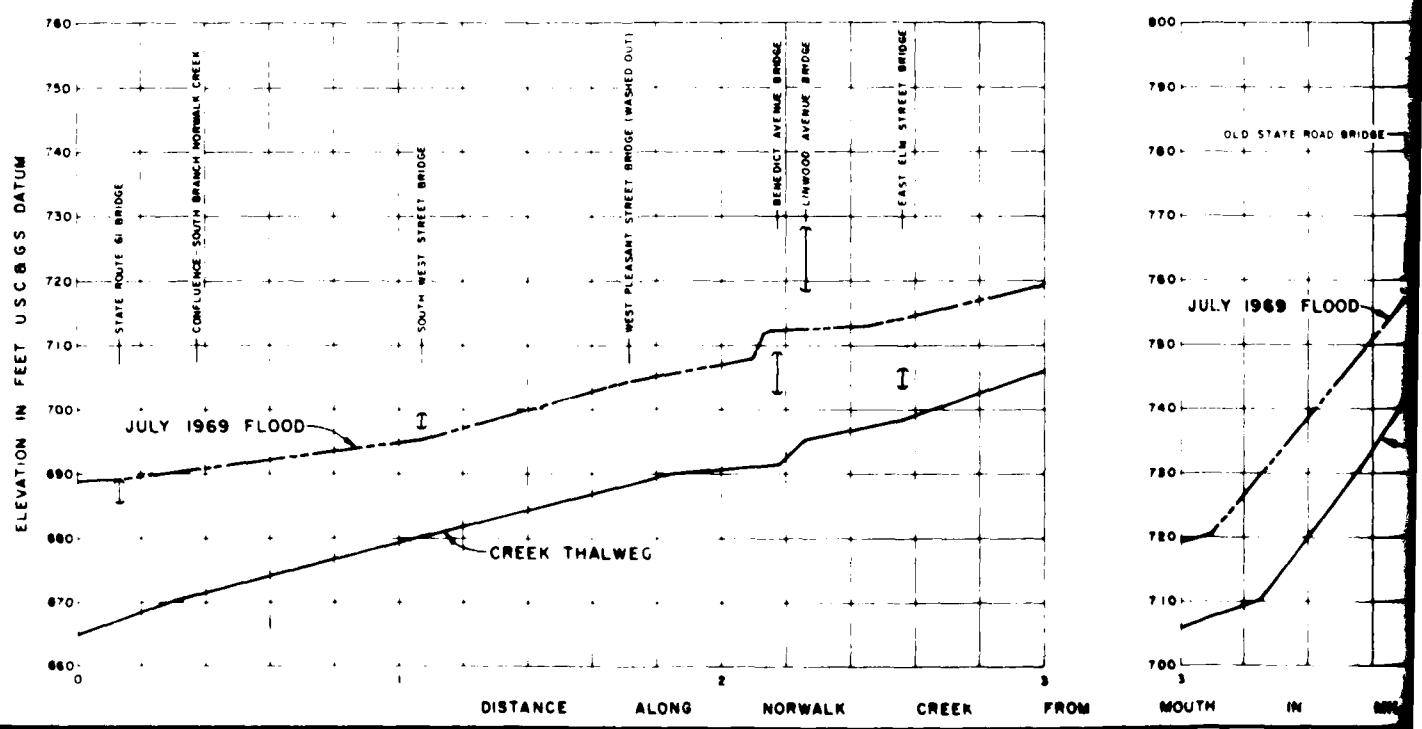
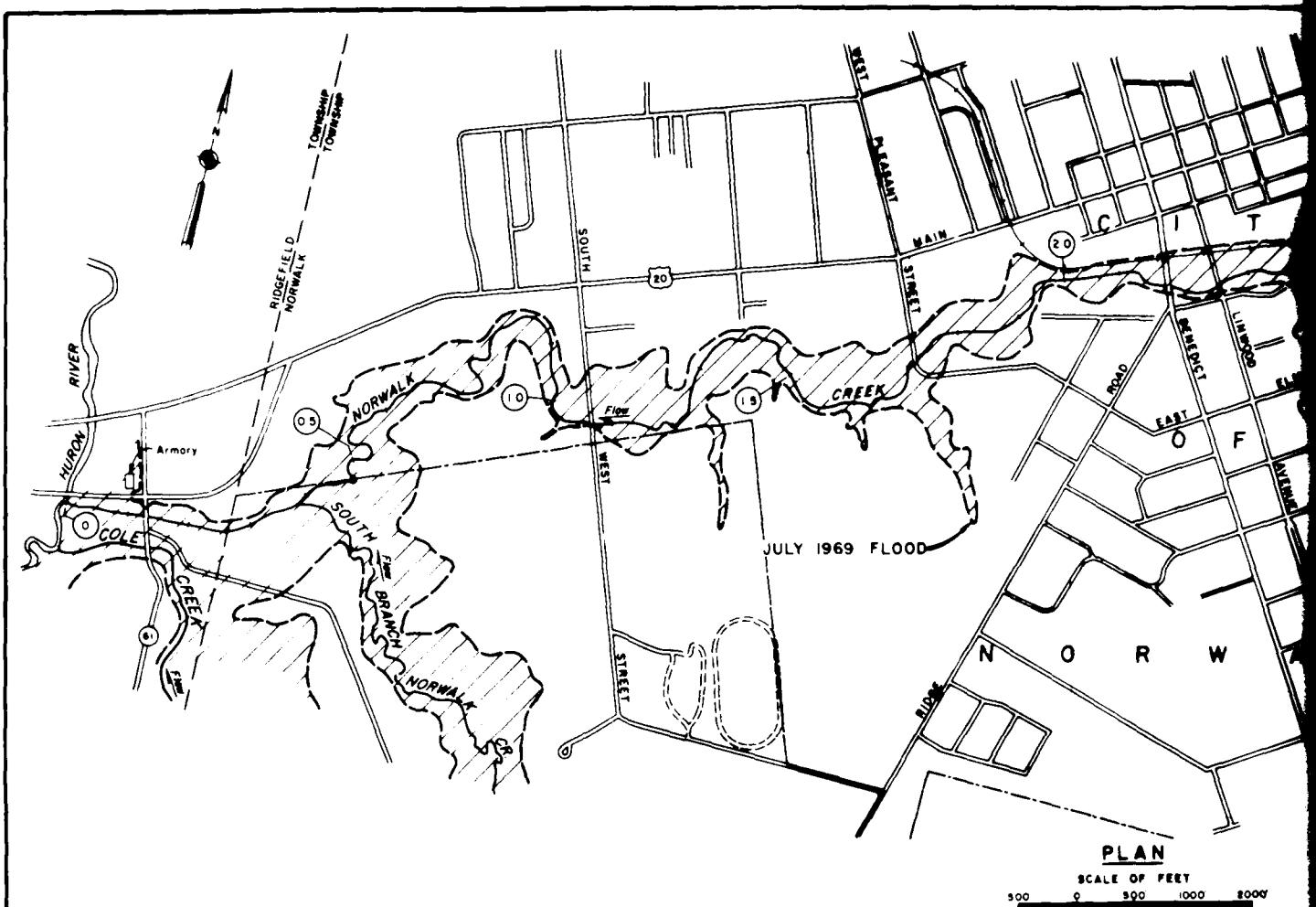
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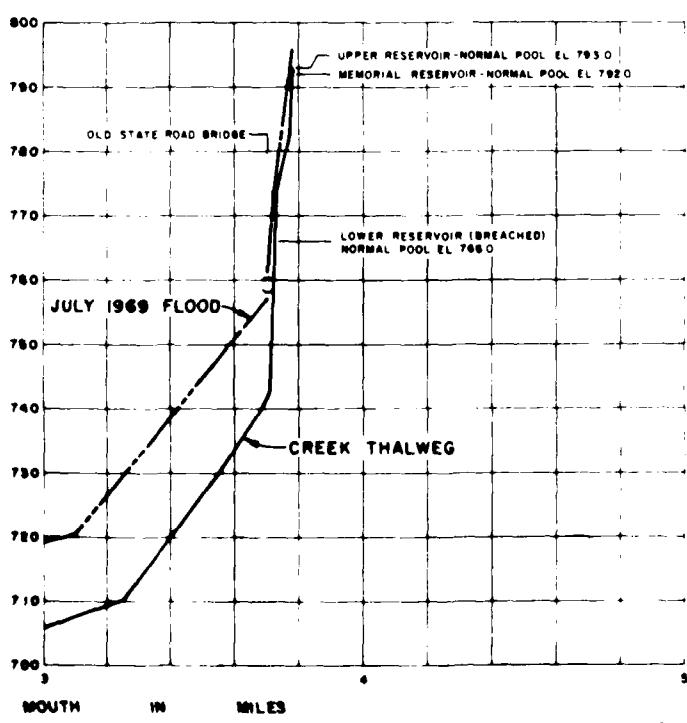
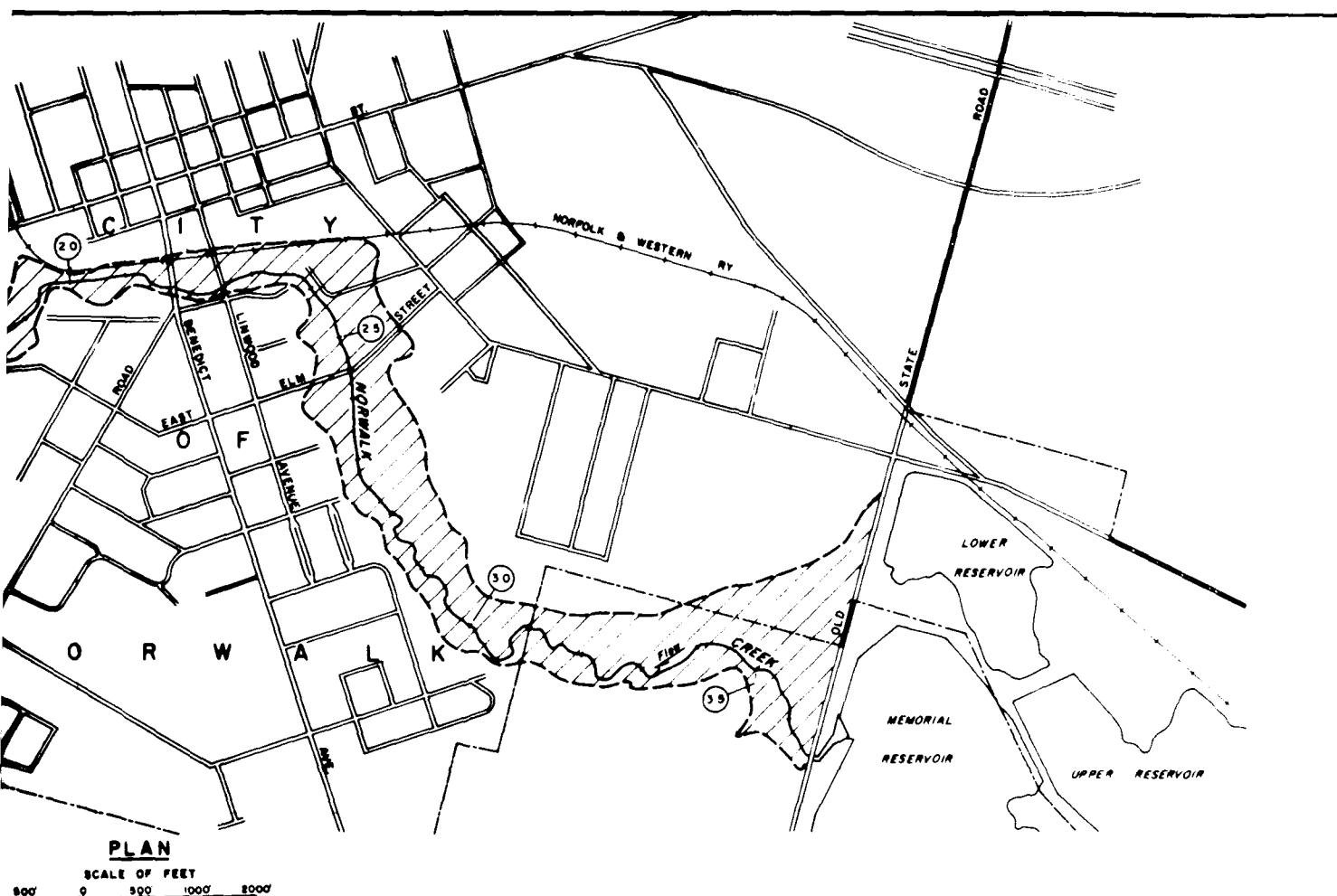
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REPORT OF FLOOD 4-7 JULY 1969
HURON RIVER
WATER SURFACE PROFILE
EAST BRANCH
U. S. ARMY ENGINEER DISTRICT, BUFFALO
MARCH 1970

PLATE II





REPORT OF FLOOD 4-7 JULY 1969
NORWALK CREEK

FLOODED AREA MAP AND
HIGHWATER PROFILE

U.S. ARMY ENGINEER DISTRICT, BUFFALO

MARCH 1970

PLATE 12

END

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